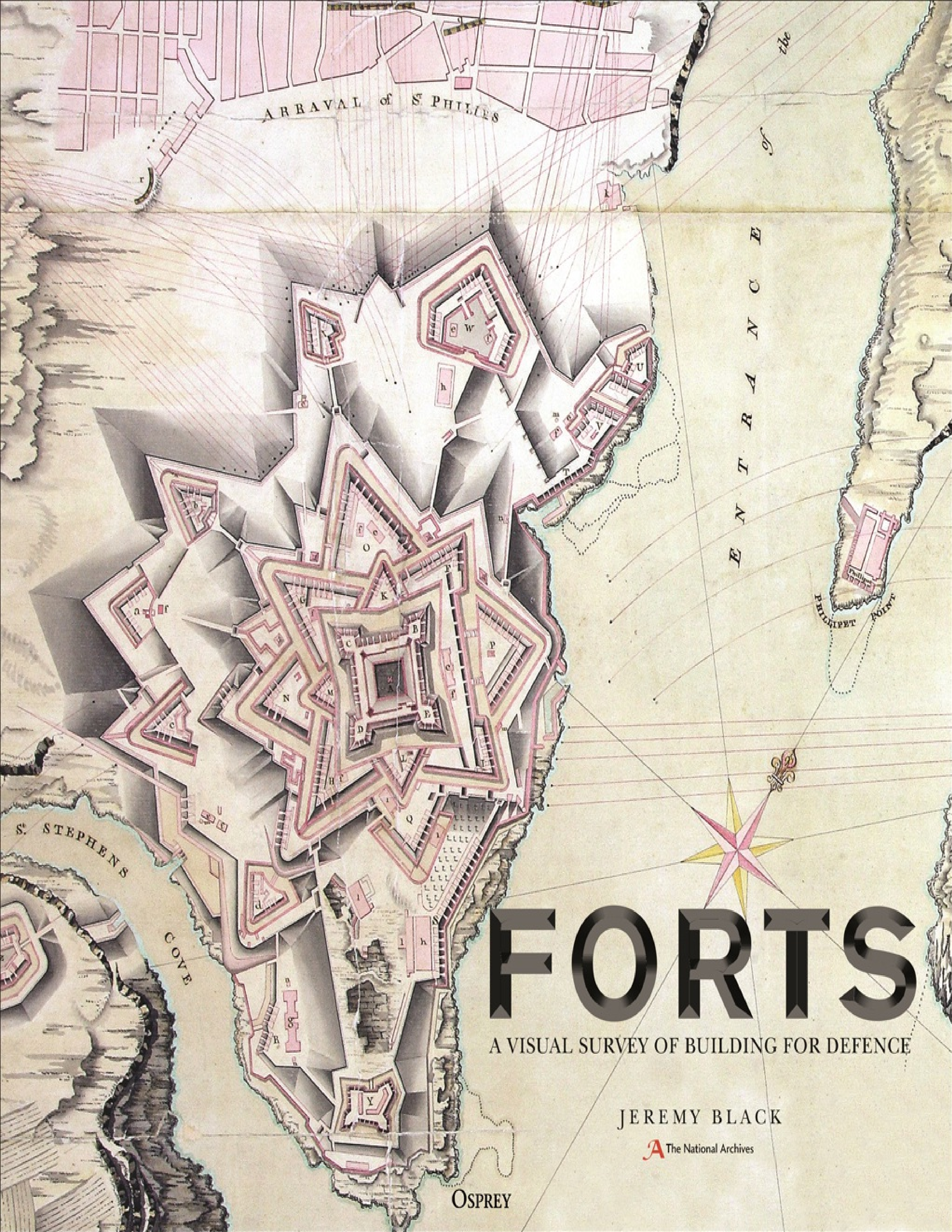
ARRAVAL of St PHILIPS
ENTRANCE of the
PHILIPET POINT
St STEPHENS COVE

FORTS

A VISUAL SURVEY OF BUILDING FOR DEFENCE

JEREMY BLACK

The National Archives

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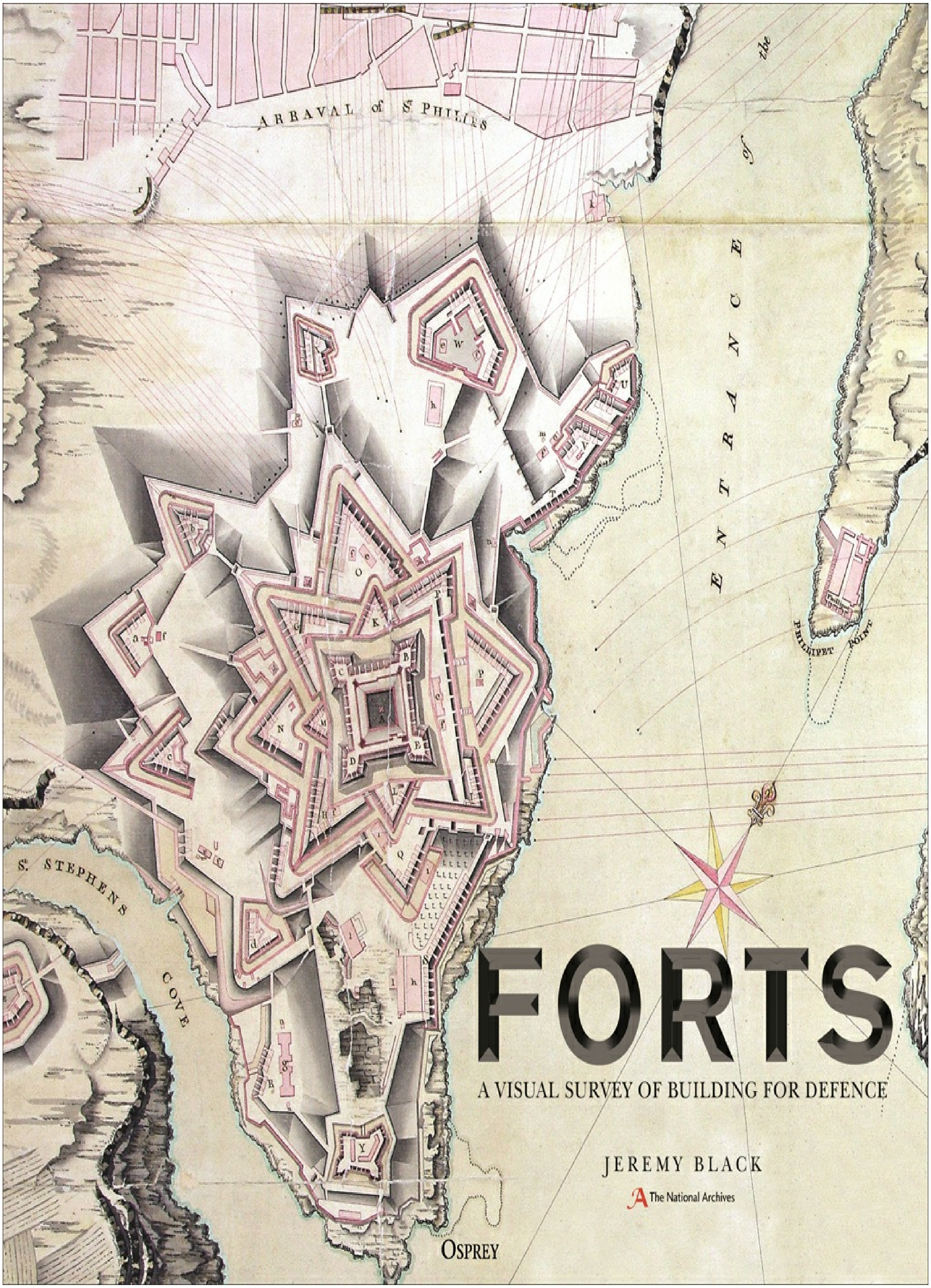
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AN ILLUSTRATED HISTORY

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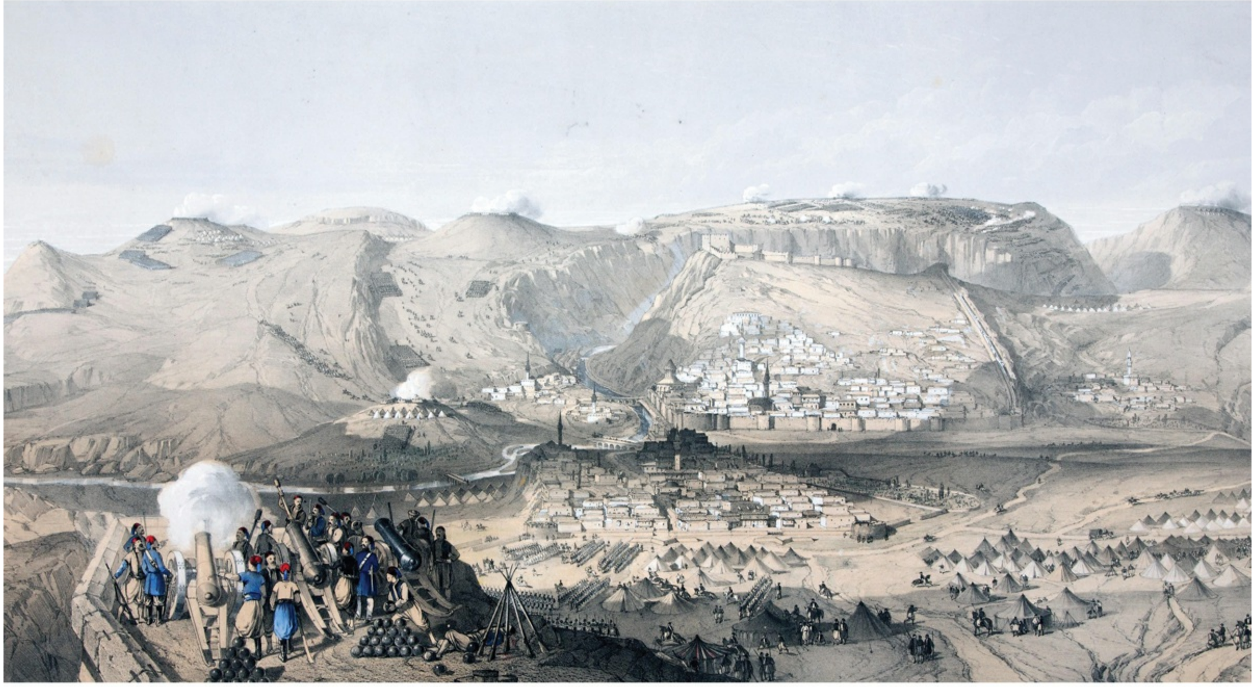

The fortress and field defences of Kers, 1855

OSPREY
PUBLISHING

FOR PETER CLARKE

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PREFACE

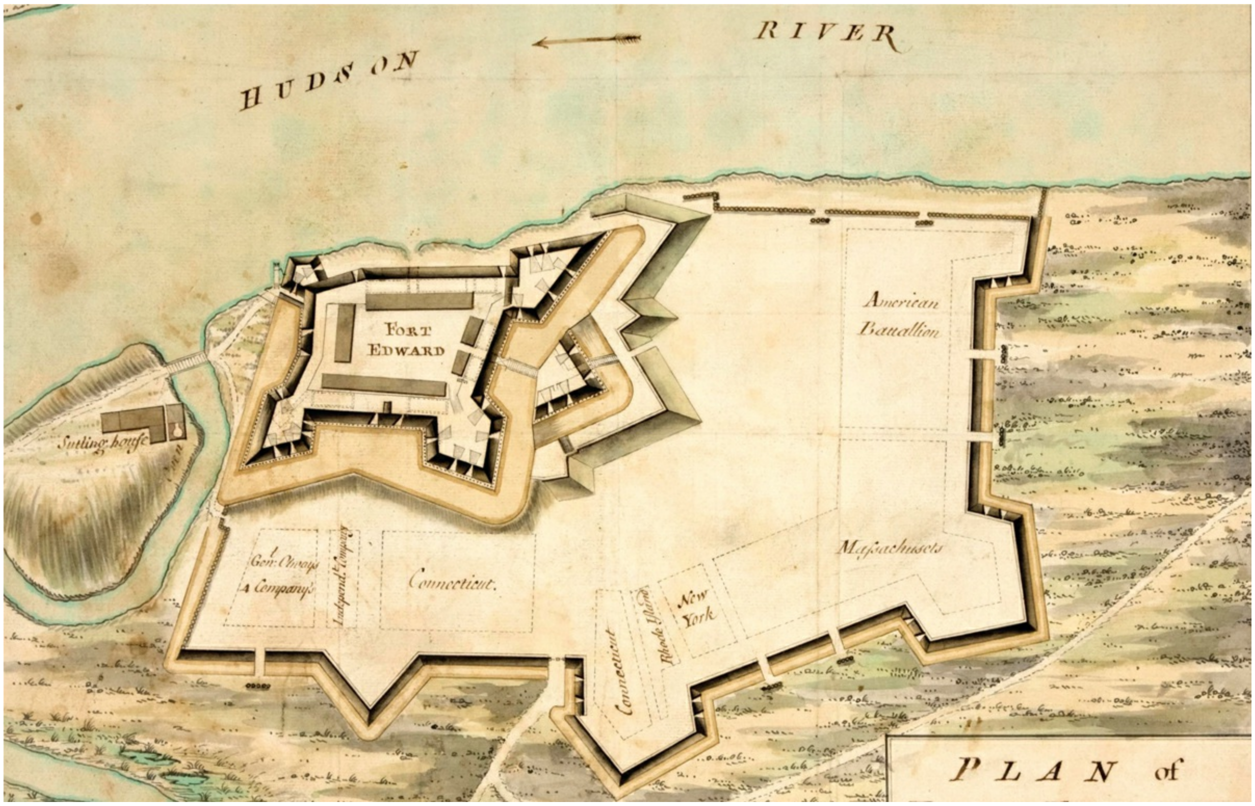
Centres for defence and bases for attack, fortifications are a crucial aspect of military history. Their remains offer a still potent, and often dramatic, testimony to the strength of these sites and the power of these works. This book provides a history of fortifications based on their presentation in maps and plans. The potential threat posed by siegecraft is also considered.

As emerges repeatedly in this book, there is no clear definition of fortification. Visiting Japanese castles or German coastal defences on Guernsey, this might appear absurd, but there are, in practice, many issues of definition. To take just those examples, is a castle less of a fortification if its prime function was residential or to act as a jail? Are the German submarine pens on the west coast of France, ones that remain impressive to this day, any less fortifications because they protected the submarines against air attack? These are all dramatic examples of fixed fortifications. But what of the relationship with those that were not fixed, and never intended to be fixed? They were fortifications and designed for protection. Here we really are in conceptual, methodological and historiographical difficulties. If the emphasis is on protection then, at the individual level, armour or any form of protective clothing is fortification. If we move to the use of temporary or enhanced positions, then the trench hastily dug or the farmhouse with bolted windows and doors becomes a fortification. That approach may appear mistaken, but, given the emphasis in recent literature on both insurgencies and counterinsurgency warfare, it appears mistaken to omit the relevant defences from any discussion of fortifications. So also with irregular warfare and, indeed, with changing patterns of symmetrical conflict.

The ambiguous nature of warfare extends to the dubious use of the language of warfare to discuss very different activities. This can be seen, for example, with the use of the language of war, defences and attack to describe cancer and other diseases. There is less confusion if policing or law and order are considered because a major purpose of fortifications was indeed to provide internal security and this could be directed as much against lawlessness as against rebellion. In this case, as others, fortification ensures or enhances the capacity for defence. That point can then be taken further, into fresh fields for conceptual uncertainty, by thinking first of the fortified nature of weapons and platforms designed for, or at least used for, defensive purposes, for example, armoured trains, as in the Russian Civil War. Second comes the fortified nature of those used for attacking purposes, as with armour and secondary defensive weaponry on warships or aircraft. The notion of a bomber as a 'Flying Fortress' captures only part of its function, and certainly not that which might be more accurately conveyed by an interceptor fighter designed to block such bombers. To add to the complexity, escort fighters (and the equivalent warships) have defensive tasks as part of the process of fortifying, i.e. protecting, the strike force.

To offer a clear definition of logical weight is not credible. Here a number of criteria are offered. There is no discussion of the situation as far as war at sea or war in the air are concerned. There is, however, full consideration of non-fixed alongside fixed fortifications; although this non-fixed character does not extend to vehicles, whether chariots or tanks. Although body armour will be mentioned, the emphasis is very much not on the protection and 'fortification' of individuals. Instead, the enhancement of their protection by means of positional defences, whether permanent or not, is the subject. Correspondingly, the means employed to attack these defences will also be considered, although siegecraft focuses far more on fixed defences. Ultimately, the intention is to encourage readers to think widely about the subject. Reflecting on its complexities, not least in definitional terms, is part of this process of thought.

In one respect, the history of fortification is a history of mankind, indeed a global history. I have benefited from opportunities to visit fortifications around the world, from Japan to the United States, New Zealand to Panama, and to lecture at a number of fortified sites, including the Tower of London and the positions at Yorktown. While working on this book, I particularly profited from being asked to lecture on a tour to Peninsular War battlefields. I am most grateful to Stephen Church, Kelly DeVries, John France, Bob Higham, Kaushik Roy, and Ulf Sundberg for their advice on all or much of an earlier draft. Lisa Thomas has proved a most helpful editor. This book is dedicated to Peter Clarke, who shares my interest in military history and is the partner of Wendy Duery, a work collaborator whose help over the years has been greatly appreciated.


HUDSON RIVER
FORT EDWARD
American Batallion
Sutling house
Gen. Otways Company
Independ. Company
Connecticut.
Massachusets
New York
Rhode Island
Connecticut
PLAN of

FORT EDWARD, NEW YORK 1757 The structure was constructed in 1755 as a fort in the French and Indian War.

ORIGINS

Fortifications are a key element of human history, one that has left a lasting presence. They were also important even when the evidence for them is far more fragmentary. Humans protected themselves against the elements, both natural and supernatural, against animals and against other humans. Initially, many 'fortifications' were natural features that provided shelter and/or enhanced strength. Caves and ridges were key examples, but so were thickets in which humans on foot could protect themselves from more mobile animal opponents.

Natural fortifications remained important throughout history, including as features that provided defensive sites in conflict. Some natural fortifications were eventually enhanced. This form of protection, which initially entailed barricades of stones and earth, as well as the use of fire, tended to involve palisades of wood when domestic animals also had to be protected as well as restrained and controlled. In the absence of wood, stone could be used for such enclosures, and so could earth. Indeed, the principle of fortification is more fundamental and continuous than the means employed.

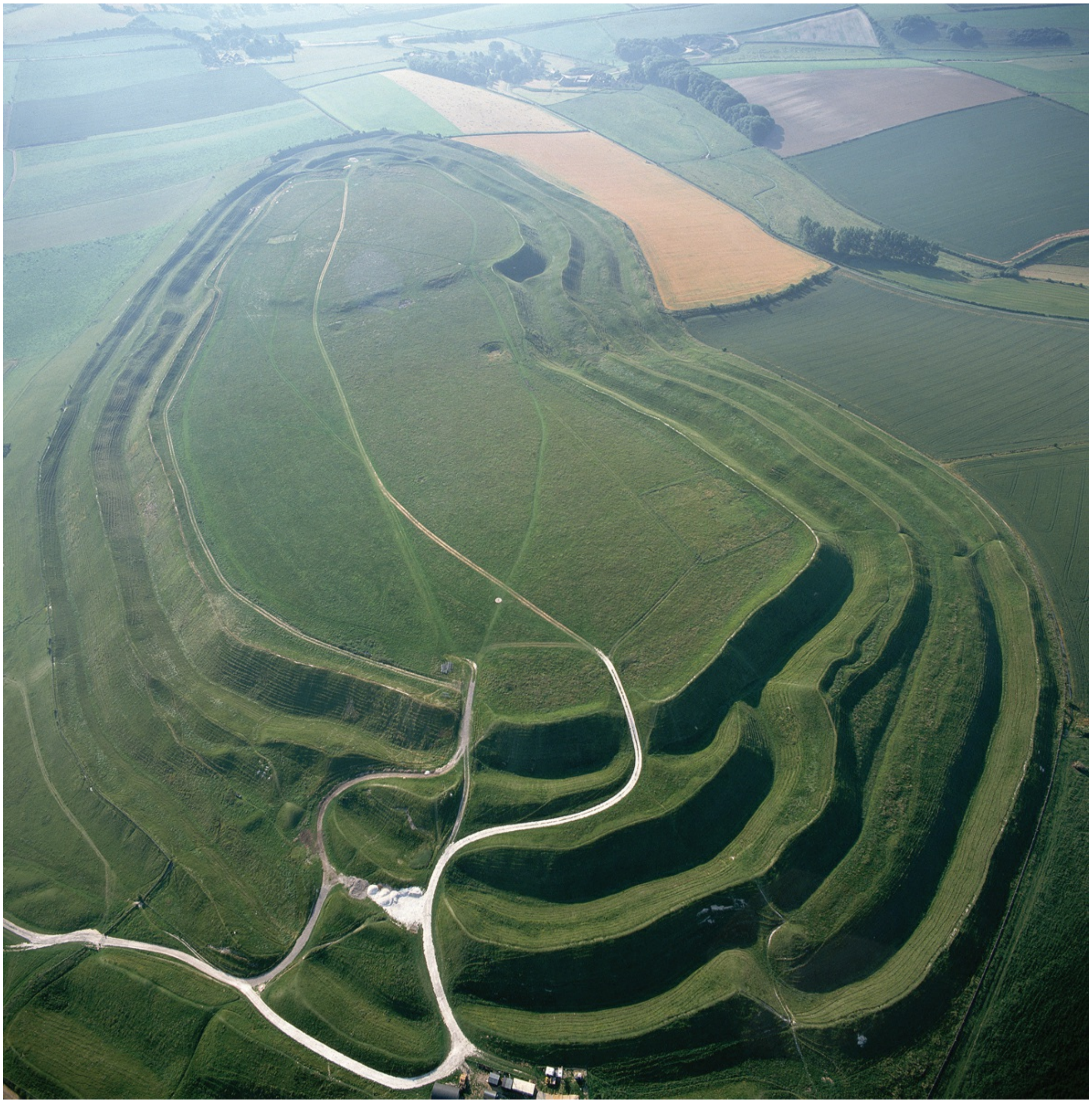
Fortifications of a more sophisticated type followed the development of states, not least because human attackers could achieve far more than animal counterparts, especially in scale and persistence but also in sophistication, for example the use of fire. The need for protection, a determination to establish control, as well as clashing interests between states, encouraged the walling of settlements and large-scale conflict, the two being closely linked. City states developed in the fertile valleys of the Euphrates and, later, Tigris in modern Iraq from the fourth millennium BC. In addition, by about 3300 BC, walled towns had begun to be built along the Nile in Egypt. Such settlements also appeared in China.

The need to come to close quarters with an enemy gave fortifications their power, which was only to be eclipsed (and then only partially) by dependable and powerful missile weapons. The viability of fortifications, moreover, was enhanced by limitations in siegecraft. However, fortifications were always in a dynamic relationship with the means to overcome them. This situation has persisted to today, and will continue into the future.

Improvements in siegecraft by the aggressive and expansionist Iraqi-based Assyrian empire in the ninth to seventh centuries BC ensured that Assyrian advances, whether or not they led to battle, could not be readily resisted by remaining behind walls, as was often the case in warfare. The stone reliefs from the palace of Nineveh, the Assyrian capital, depict the sieges of walled cities. The Assyrians used battering rams. The carvings that show them have men fighting from the tops of the towers that protect the rams: they are siege towers with battering rams or vice versa.

Aside from devices that came into direct contact with the walls, notably battering rams and siege towers, there were siege engines including those that fired projectiles, especially catapults. Large catapults could throw heavy stones designed to inflict damage to the structure, while medium-size catapults launched bolts, and lighter, hand-held ones fired arrows and small stones designed to clear away defenders from their positions. Such anti-personnel weaponry provided an opportunity for gaining tactical dominance and for the use of siege engines against the walls. Thus, they were an aspect of the degree to which sieges involved stages in order to suppress the defences.

In turn, these stages required different facets for the defence. This included firepower mounted on the walls and notably in the towers that were their strongest features. When Alexander the Great of Macedon successfully besieged the well-fortified port city of Tyre (in modern Lebanon) in 332 BC, during his conquest of the Persian Empire, the catapults were able to provide covering fire for battering rams employed to breach the walls, and for boarding bridges from which troops moved into the breaches from ships. Cannon were later to provide the breaching force of the battering rams without needing close contact.



MAIDEN CASTLE, ENGLAND Maiden Castle outside modern Dorchester survives as a striking manifestation of the task the invading Romans faced. The serried banks of the hill fort, which belonged to the tribe of the Durotriges, were calculated to break up an attacking charge. The innermost bank would have carried a palisade. These hill forts, however, were to be vulnerable to Roman siegecraft after a major invasion was launched in ad 43. Maiden Castle was stormed by Vespasian, who later became Roman Emperor.

GWALIOR FORT, INDIA A hill fort in central India that has existed since at least the tenth century. The fort overlooks the city of Gwalior. Its significance rested on its position as a protection against expansion by the Sultanate of Delhi. In the fifteenth century, the fortifications were strengthened by the ruling Tomar family, only for the Mughals to gain control, until the Marathas seized the fort from the mid-eighteenth century. Generally thought impregnable, the fort fell to the British in 1780 when it was stormed by escalade.

The Hellenistic powers that succeeded Alexander's empire, and that dominated the Near East and the Eastern Mediterranean until the first century BC, were able to produce more formidable siege weapons such as battering rams sheathed with iron and mounted on rollers. At the siege in 305–04 BC of Rhodes, a city that continued to be an important and contested fortified position into the sixteenth century, there were also iron-tipped borers (made effective by a windlass, pulleys and rollers) that were designed to make holes in the walls. In addition, siege towers became larger and heavier, and therefore able to project more power. They were also better defended, for example with iron plates and goatskins to resist the fire missiles and catapults launched from the positions under attack. Flexibility in usage was crucial, as these siege towers could be assembled and disassembled or, alternatively, made on site if timber was available.

The Romans were also adept at capturing fortresses, while they built encampments as a matter of course on the march, and established permanent garrisons on, or close to, their frontiers. Both China and the Romans built formidable series of walls, including the Long Walls of Wei, Zhao and Yan (*c.*350–290 BC) in China and the Roman limes, notably between the upper Rhine and the upper Danube. These walls were supported by fortresses. In China, siege warfare developed with the use of siege towers and stone-throwing catapults (both also used by the Romans) against cities protected by thick earth walls behind deep, wide ditches. Due to their large armies, the Chinese and Indians surrounded fortified positions in order to establish blockades.

In the case of England, the remains of forts are readily apparent from the Bronze Age on, but hill forts became more common with the Iron Age from *c.*700 BC, although they were probably places of refuge rather than inhabited sites. In particular, this was because hilltops faced issues with the availability of water. They were often within visual contact of each other. Most English sites were relatively modest, for example Woodbury Castle in Devon, although Maiden Castle in Dorset was far more formidable.

In turn, the Romans were major fort builders in Britain, not least with their substantial legionary bases such as Deva (Chester), Eburacum (York) and Isca (Caerleon), as well as with shorter-lived legionary bases, for example Exeter. Moreover, Hadrian's Wall was built to mark the northern frontier, while the forts of the Saxon Shore were built from the 270s onward from Brancaster, Norfolk, to Portchester, Hampshire, in order to limit attacks by seaborne raiders from Germany. These forts, most of which had protruding towers, were designed to protect harbours and estuaries. The standard Roman emphasis was on round-fronted protruded towers that were able to provide enfilading fire against attackers, for example at Jerusalem.

The construction of town defences in the Roman Empire from the third century, for example in Britain and Spain as well as a formidable wall at Rome in the 270s, indicated an attitude of growing defensiveness in the face of outside attack. This pattern of town walls remained significant under the 'barbarian' conquerors of the Roman Empire once they had established states of their own. Thus, Roman traditions were important under the Visigoths in

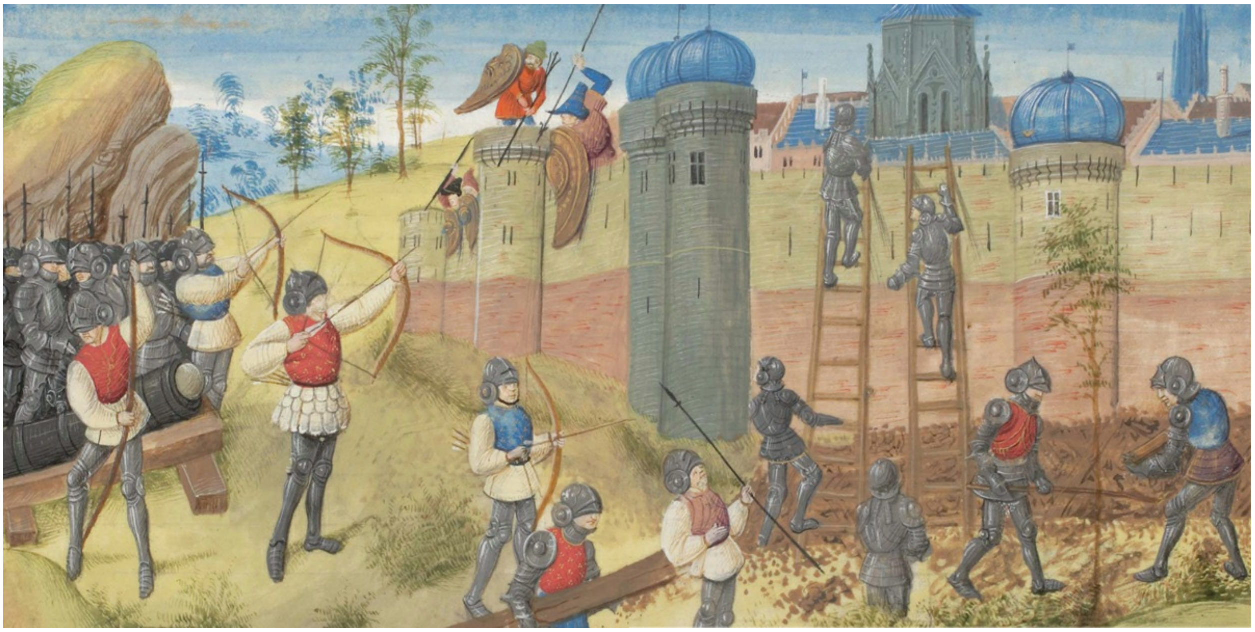
Spain and southern France, as at Carcassonne and Toulouse, and under the Franks in France. As a defence against Viking advances along rivers, fortified bridges were used under the Franks in the ninth century.

In southern England, Alfred, King of Wessex, encouraged the creation of burhs (fortified proto-towns) in the late ninth century as a key part of the defensive system designed to resist the Vikings. Some were refurbished Roman town defences. Others were new. This system was continued by Alfred's successors, as they established the Old English state in the tenth century, notably conquering the Viking-held East Midlands. In addition, private defended residences, the basis of castles, existed in the late Saxon period, some built by Norman and French protégés of Edward the Confessor (r. 1042–66). Similar developments were seen elsewhere in Western Europe.

In south-eastern Europe, the Eastern Roman (Byzantine) Empire maintained formidable defences, notably at Constantinople (Istanbul) and at Salonica. Existing fortifications were improved, as in the Near East with the massive Byzantine city wall at Antioch in the sixth century, which had about 60 towers divided into two groups: large polygonal master towers, and smaller square towers dependent on them. This was a clear instance of the threat-based nature of fortification. Concern about expansion by the Sassanids of Persia (Iran) led to Byzantine fortifications in the region.

HADRIAN'S WALL, ENGLAND The Romans built supporting forts, such as Housesteads, as part of Hadrian's Wall, a 73-mile long fortified stone wall constructed from about AD 122 by the Emperor Hadrian across Britain at its narrowest from Tyne to Solway. This was a border, a base for the projection of power, a defensive means and a customs' line. The wall took advantage of terrain features, notably a volcanic sill. The wall was crossed in an attack soon after AD 180 but thereafter was held until the end of Roman rule.

THE MEDIEVAL CASTLE



Castles were a potent display of power and an impressive force multiplier. Surviving examples of stone castles provide ample illustrations of how they literally towered over and commanded the surrounding countryside. Stone was not vulnerable to fire, as wood very much was, and the strength of the defences posed tactical and organisational problems for attackers, especially the difficulty of providing supplies for besieging forces. Western European states tended to put more of an emphasis on stone than their counterparts in China, India and South-East Asia where the emphasis was on the use of earth or timber. At the same time, so-called stone castles had plenty of wooden components, and mining, i.e. the undermining of the walls, by means of a fire-filled tunnel under a wall, was very much feared.

In terms of power and display, there was also the issue of scale, and notably the size of fortified cities, such as Milan and Antioch, when contrasted with the relatively modest size of attacking forces. This helped to lead to a pattern of focusing the attack on the gates, a focus that left armies vulnerable to sallies by the defenders. When combined with the operation of relief forces, as with the Crusader siege of Antioch in 1098 during the First Crusade, this vulnerability ensured that sieges were an aspect of field operations as a whole.

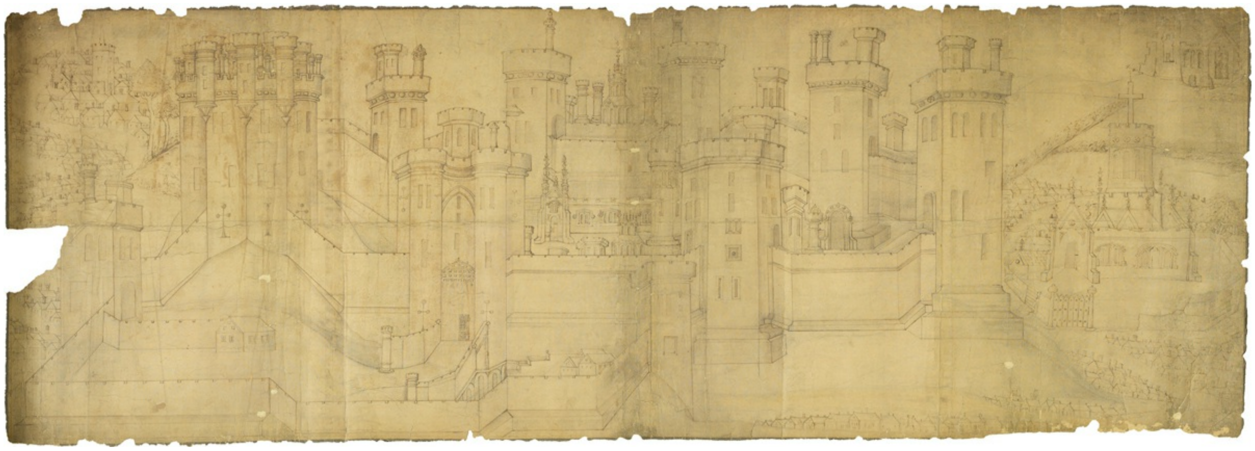
As always with fortifications, more than the fortresses themselves was at stake. Instead, castles, like other fortifications, were particularly effective as part of a combined military system. Indeed, European military history in the eleventh to thirteenth centuries in part centred on how the Frankish development of knights, castles and siege techniques enabled the rulers who employed them to extend their power, both against domestic opponents and on their frontiers. The latter forced the rulers of more peripheral regions, such as Lithuania, Prussia, Scotland and Wales, to build castles of their own.

Castles, however, were affected by the danger of denuding them of troops in order to create a field army and by the psychological effects of the defeat of such an army, as when Saladin's defeat of the army of the kingdom of Jerusalem at Hattin in 1187 was followed by the capture of Acre, Jerusalem and other fortress garrisons that, without a supporting army, were in too weak a position to hold out.

The Crusades exposed the European military system to particular challenges. With the development of the concentric plan, castle design in the Crusader lands was more advanced than in Europe because of the major challenges the Crusaders had to face from larger Arab armies and their effective siege techniques.

Krak (or Crac) des Chevaliers, one of the most impressive surviving medieval military sites, was originally built on by the Arabs to guard the route from Tripoli to Hamah. The Crusaders developed the fortifications under the Count of Tripoli, but the castle that survives was totally rebuilt by the Hospitallers (Knights of St John) after they obtained it from the count in 1142. It successfully held out against Saladin in 1188, ensuring that it was one of the few remaining Crusader castles in 1190. The defences were improved at the start of the thirteenth century, not least with the construction of an outer wall strengthened by semi-circular protruding towers. The nature of the site made mining difficult. The multiple character and interlocking strength of the defences ensured that, once the outer walls had been penetrated, it was still necessary to advance along overlooked corridors and ramps. Castle architecture reflected the role of specialists in fortification technology.

Despite this, the fortress fell to the Mamluks after a siege of scarcely more than a month in 1271 as they rolled up the remains of the Crusader world. Krak was a hideout for rebel troops in the Syrian conflict of the 2010s and was bombarded by Syrian and Russian aircraft, bringing down some of the outside walls. The Mamluks captured Acre in 1291 with a determined assault after its defences had been weakened by trebuchets and, more significantly, by mining, which brought down a large chunk of the south wall.



PONTEFRACT CASTLE, ENGLAND, 1561 A major medieval castle, originally built in about 1070, in wood, and later rebuilt in stone, as was normal for significant positions. A large keep was built in the thirteenth century. Thomas, Earl of Lancaster, was beheaded outside the walls in 1322 at the orders of his cousin Edward II, who had defeated him. The seat of John of Gaunt, Duke of Lancaster, the castle was where his son, Henry IV, had deposed Richard II, murdered in 1400. During the rebellion of the Pilgrimage of Grace in 1536 against Henry VIII, the castle was handed over to the rebels by its guardian, Thomas, 1st Lord Darcy, who was subsequently executed for high treason. This illustration is from a 1561 survey. Oliver Cromwell described the castle as ‘one of the strongest inland garrisons in the kingdom’. It was besieged by Parliamentarian forces during the Civil War and, once captured, was deliberately ‘slighted’, or ruined, by them in 1649 in order to prevent its subsequent use in a rebellion.

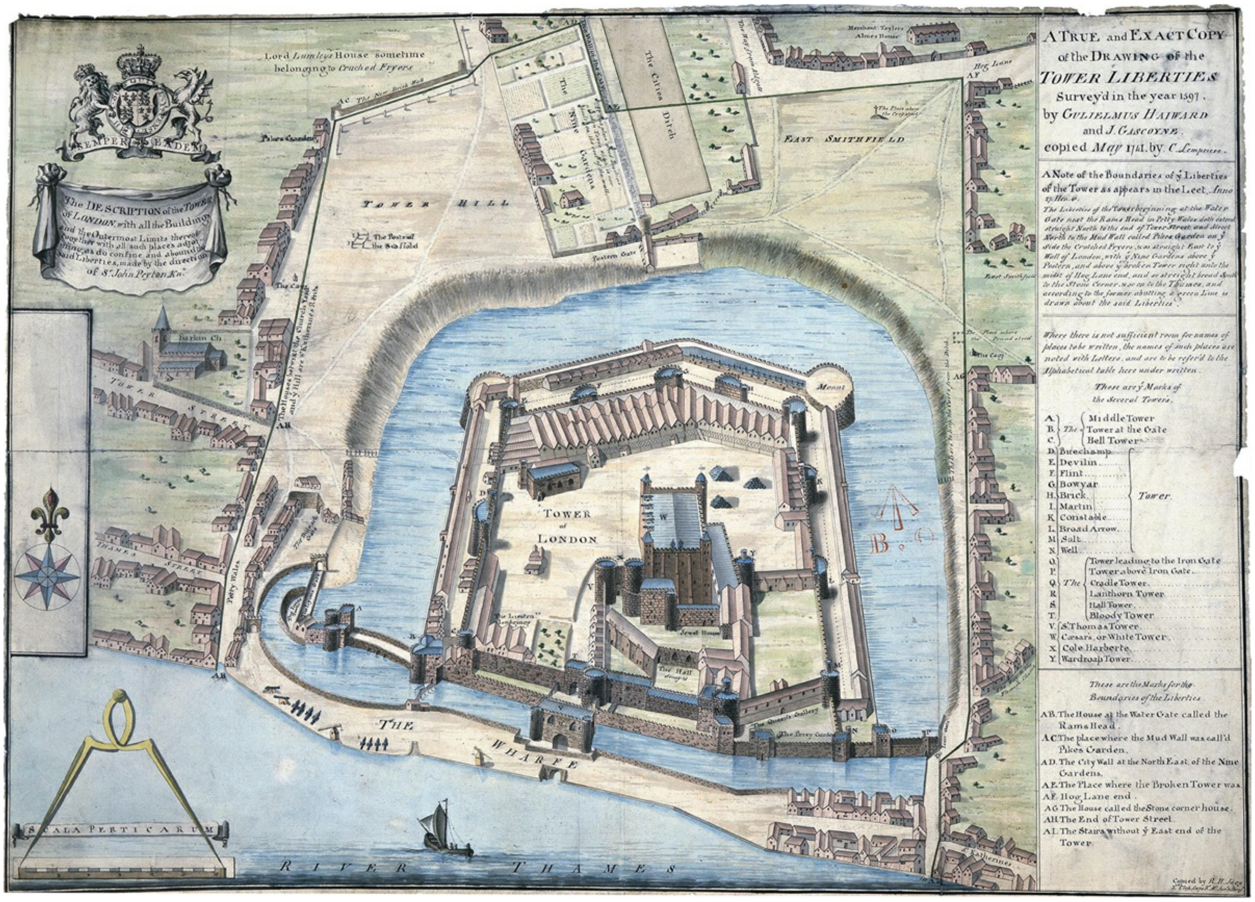
NORMAN CASTLES

In England, after the Norman Conquest in 1066, castles were very different to the characteristic feature of Anglo-Saxon fortification, the burh or fortified town. Early Norman castles in England and Wales were generally motte-and-bailey or ringwork (enclosure) forms: earth and timber constructions, thrown up in a hurry (although still requiring many man-days to construct) and able to give protection against local discontent. Motte-and-bailey forms had a long currency in the British Isles to the thirteenth century, as did ringworks. Cost and the shortage of skilled masons made construction in stone less attractive, but not all early Norman castles were built of timber and earthwork. Exeter, London and others had early stone phases.

Castle design, whether of timber, stone or both, was intended to promote a powerful symbol of the new landholding families in relation to each other. William I, the Conqueror (r. 1066–87), and his successors also maintained castles in the shire towns (as well as in London) as part of their framework of royal government. Domestic control was a key feature in the history of fortification, and security against internal rivals was just as important as defence against external threat. With time, there were improvements in castle design. Thus, in London, the great White Tower constructed during the first 40 years of Norman rule as the Tower of London was later surrounded by a succession of walls and defensive towers. Two sets of encircling defences were added in the thirteenth century. Substantial river defences and a moat were part of the powerful new complex.

As a separate purpose, castles, such as the White Tower and Windsor for the Crown, had a key function as fortified residences. Especially in Western Europe, there was a contrast in focus between the situation in which castles were fortifications and used as instruments of conquest, and the degree to which the majority of castles were also homes (however occasional their use as such), as well as administrative centres for the estates (or states) that belonged to their owners.

Town walls were intended to control the entry of people and goods. Castles were easier to defend than fortified towns as the fortifications of the latter had to be related to the towns, while castles could be sited very much for defensive considerations, particularly taking advantage of hillsides and their ability to magnify the problems facing attackers. While true in the military context, it is notable how, especially in England, many castles were in not very defensible places, which reflects their social and administrative status and attributes. At the same time, in England references to the sieges of towns were not common between 1070 (after William I's suppression of English rebellions based in towns) and the thirteenth century. Sieges of castles, however, characterised warfare.



SEMPER EADEM
The DESCRIPTION of the TOWER of LONDON, with all the Buildings and the Outermost Limits thereof together with all such places adjoyning as do confine and abound the said Liberties, made by the direction of Sr. John Peyton Knt.
A TRUE and EXACT COPY of the DRAWING of the TOWER LIBERTIES Survey'd in the year 1597. by GULIELMUS HAIWARD and J. GASCOYNE, copied May 1741. by C. Lempriere.
A Note of the Boundaries of ye Liberties of the Tower as appears in the Leet Anno 27 Hen. 8.
The Liberties of the Tower beginning at the Water Gate next the Rams Head in Petty Wales doth extend straight North to the end of Tower Street and direct North to the Mud Wall called Pikes Garden on ye side the Crutched Fryers, so so straight East to ye Wall of London, with ye Nine Gardens above ye Postern, and above ye broken Tower right unto the midst of Hog Lane end, and so streight broad South to the Stone Corner, so so on to the Thames, and according to the former abutting a green Line is drawn about the said Liberties.
Where there is not sufficient room for names of places to be written, the names of such places are noted with Letters, and are to be refer'd to the Alphabetical table here under written.
These are ye Marks of the Several Towers.
A. The Middle Tower
B. The Tower at the Gate
C. The Bell Tower
D. Buechamp Tower
E. Devilin Tower
F. Flint Tower
G. Bowyar Tower
H. Brick Tower
I. Martin Tower
K. Constable Tower
L. Broad Arrow Tower
M. Salt Tower
N. Well Tower
O. The Tower leading to the Iron Gate
P. The Tower above Iron Gate
Q. The Cradle Tower
R. The Lanthorn Tower
S. The Hall Tower
T. The Bloody Tower
V. St. Thomas Tower
W. Caesars, or White Tower
X. Cole Harberte
Y. Wardroap Tower
These are the Marks for the Boundaries of the Liberties
AB. The House at the Water Gate called the Rams Head.
AC. The place where the Mud Wall was call'd Pikes Garden.
AD. The City Wall at the North East of the Nine Gardens.
AE. The Place where the Broken Tower was.
AF. Hog Lane end.
AG. The House called the Stone corner house.
AH. The End of Tower Street.
AI. The Stairs without ye East end of the Tower.
TOWER HILL
EAST SMITHFIELD
The Cities Ditch
Barkin Ch
TOWER STREET
TOWER of LONDON
THE WHARFE
RIVER THAMES
SCALA PERTICARUM

TOWER OF LONDON, ENGLAND, 1597 Originally established by William I, the Tower was built on to the south-east corner of the walled Roman city. The White Tower, the centrepiece of the fortress, the earliest stone keep in England, was probably finished by 1100. A wall was built around the tower. Expanded in 1189–90, notably with the digging of a moat, it was greatly extended in the thirteenth century, not least with two new defensive perimeters. The wall took advantage of terrain features, notably a volcanic sill. Visitors had to negotiate a barbican and three gatehouses. The castle was successfully besieged in 1191, and unsuccessfully in 1214–15 and 1267. In 1191, Prince John succeeded because the defenders rapidly ran out of food. In 1381, during the Peasants' Revolt, the rebels captured the Tower, the gates of which were open to receive the King. There was no resistance, and royal officials there were killed and the Tower looted. During the Wars of the Roses in the late fifteenth century, the Tower was fortified to resist artillery. Henry VI and Edward V were murdered in the Tower, in 1471 and 1483 respectively. This is a copy of a 1597 survey.

FORTS IN TERRITORIAL EXPANSION

Castle building was also an aspect of the expansion of territorial control, although castles built to attack or defend had a radius of power of only about 15 miles. This was a good patrolling journey for a mounted man without killing his horse. It would be less on rough ground or in mountains. Castles were built to consolidate Christian expansion and as bases for fresh expansion.

This was the case in Spain and Portugal during the lengthy wars with the Moors from the eighth to the fifteenth centuries. During the Reconquista, the Moors, in turn, built castles opposing those of the Christians. Pretty much every Christian castle was answered by a Muslim one and vice versa. For example, Loarre Castle in Huesca province, built in the eleventh century, is 10 kilometres from its opposing Muslim castle, each able to see the other. In the Baltic lands, where the 'Northern Crusades' were being staged, castles were built as control was seized over the local people. In Flanders in the early fourteenth century, the French sought to use the construction of castles to advance their interests, as at Lille.

Meanwhile, fortification techniques developed, not least with the enlarging of the size and raising of the height of castle works, and the increase in their complexity, especially in the thirteenth century. Raising the height was important in the pre-cannon era because threats were posed by scaling, archers and stone-throwing weapons.

In Britain, Wales was a prime example of the use of fortresses in territorial expansion. Castles were built both by the English Crown and by Norman aristocrats seeking to expand their power. William I was probably responsible for building Cardiff Castle when he visited Wales in 1081. One of his lords, William FitzOsbern, had already built a stone castle, the first in Wales, at Chepstow in 1067–71, and used it as a base for expansion. Another, Roger de Montgomery, founded a timber castle at Montgomery, and advanced from there into central Wales. He was also responsible for pressure further north from the castle at Oswestry built in the late 1080s. Castles provided refuge from Welsh attack, but could also be easily bypassed. Thus, fortress construction did not fully stabilise Norman control. Instead, the Normans had to rely on light forces of their own to pursue Welsh raiders. Lightly armed cavalrymen linked to castles were one remedy.

Edward I's conquest of north-west Wales from 1277 was particularly significant. The castles the Welsh built did not delay or deter Edward's armies to any real extent. The sole significant siege of a Welsh castle was Dryslwyn in 1287, during a rebellion in south Wales. A trebuchet was used at Dryslwyn, which was then taken to Newcastle Emlyn in a column of 80 carts. Welsh castles were places of last retreat, and did not play a significant strategic role. Revolts in 1287 and, more seriously, 1294–95, encouraged Edward to press on with his programme of fortifications. The major new fortresses built for Edward by Master James of St George, especially Caernarfon, Conwy, Harlech and Beaumaris, were all coastal castles that could be supplied by sea. Most of the heavy building materials for their construction were brought the same way. The construction of these massive stone-built works was a formidable undertaking, costing at least £93,000 and using thousands of English workers who were attracted by higher wages than those offered by the Church, which misleadingly complained that its builders had been conscripted. This effort reflected the strength and administrative sophistication of the English monarchy.

The forts, or in the case of Caernarfon a fortress palace, were a demonstration of power, royal ideology and imperial pretension. They also proved their worth in the face of rebellions, notably that under Owain Glyn Dŵr (Owen Glendower) in 1400–08, although Harlech and, more briefly, Beaumaris and Conwy were lost then. Welsh guerrilla tactics and devastation could not challenge the English castle garrisons effectively.

English expansionism in Ireland was also marked by the construction of castles, such as Athlone, Carrickfergus, Coleraine, Dundalk, Kildare and Trim. At Athlone, the wooden structure built in 1129 by the native king of Connacht was replaced in 1210 by a stone tower built on a motte by the English. A curtain with towers was added in about 1276.

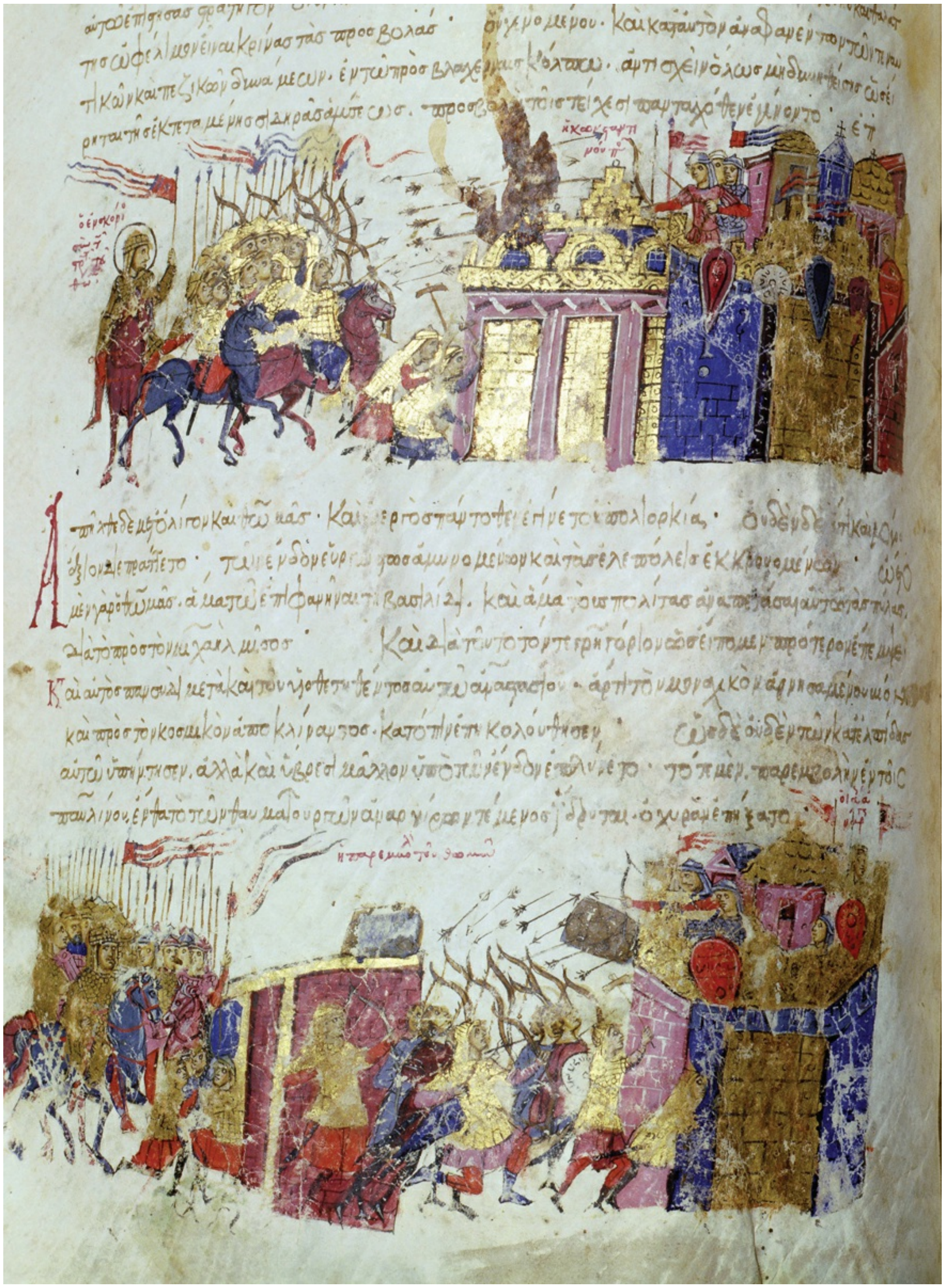
Within England, castles such as Elmley in Worcestershire, built in the late eleventh century and a seat of the Beauchamps, a major aristocratic family, were both a symbol and a reality of regional power. Civil wars also saw castle building. Thus, under King Stephen (r. 1135–54), prominent nobles, for example John the Marshal in Hampshire and Wiltshire, used the conflict to pursue their own interests and strengthen their local power, and many castles were built. Similarly, in 1138, Stephen's influential brother, Henry of Blois, Bishop of Winchester, is reported to have begun six castles.

In the thirteenth century, the government of young Henry III (r. 1216–72), which had benefited in 1217 from the strength of Dover and Lincoln castles when resisting French and pro-French attacks, restored authority by castle sieges, notably at Bedford. Later in the reign, Henry III did the same after the rising of Simon de Montfort, particularly at Kenilworth in 1266, which became a six-month siege, the longest in English medieval history. Both sides used stone-throwing machines, while the water defences prevented the royal forces from undermining the defences. Disease and food shortages led to the surrender.

Sieges were also significant to the restoration of authority in the fourteenth and fifteenth centuries. Battles, not sieges, proved the centrepiece in short campaigns, as in the Wars of the Roses in the late fifteenth, but castles were besieged. For example, Dunstanburgh Castle on the Northumbrian coast was successfully besieged by the Yorkists in 1462 and 1464 and badly damaged.

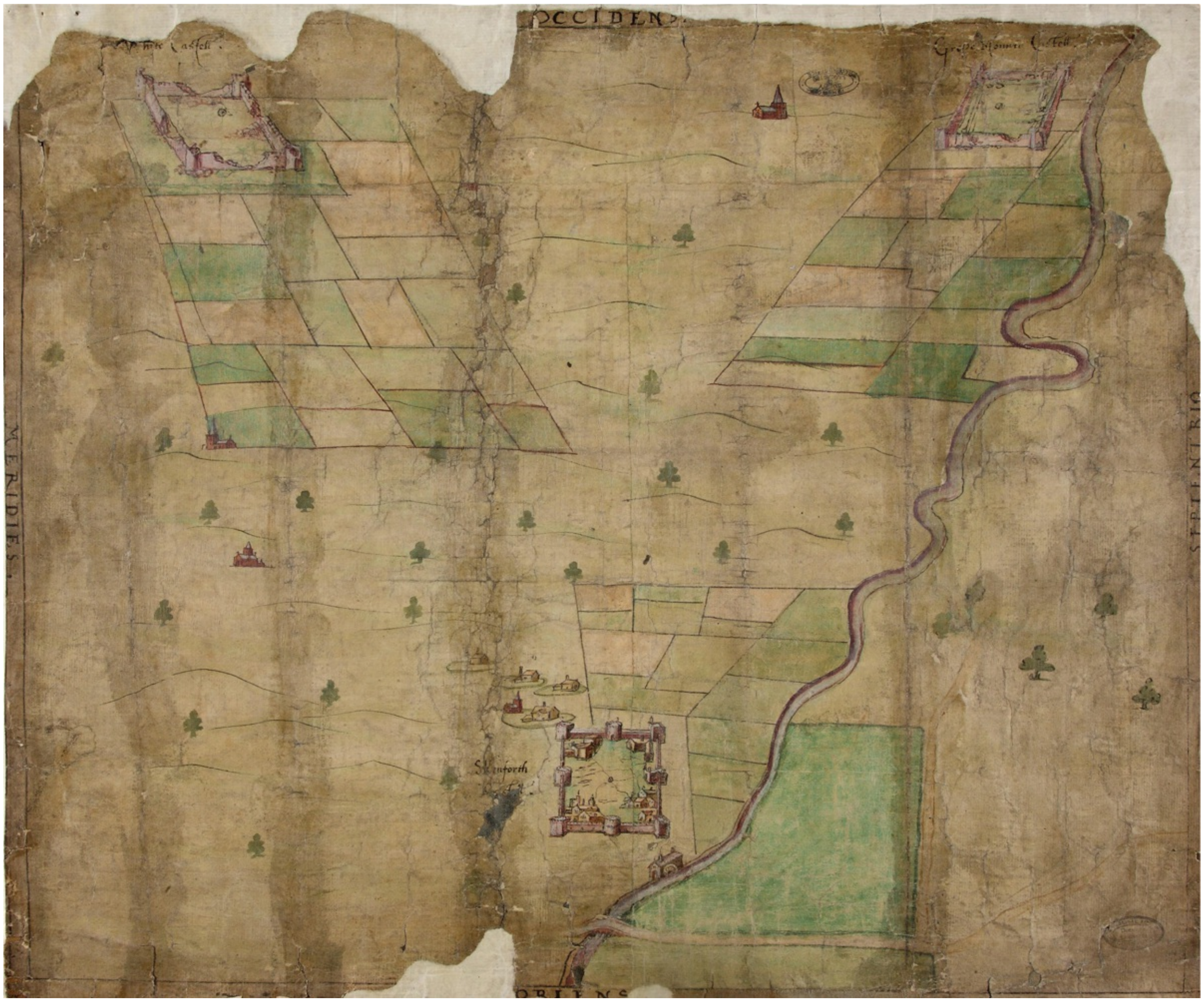
THE THREAT OF CANNON

In the fifteenth century, across Europe fortifications increasingly had to respond to the threat or apparent threat of cannon. Improvements in the production of iron, making it possible to manufacture larger cannon, were important, as was the replacement of stone by iron cannonballs, the use of more effective gunpowder, changes in the transport of cannon, and the development of the trunnion (supporting cylindrical projections on each side of cannon), which made it easier to alter the angle of fire and increased mobility; all of these increased the effectiveness of artillery. As a result, the stone-throwing trebuchets went out of fashion relatively quickly after cannon were deployed, with only a few appearing after 1415. Less bulky, cannon eventually offered a greater mobility and accuracy. Moreover, located on the ground, cannon were far less vulnerable than siege towers to the counter-battery fire from the cannon in the besieged fortresses. As a consequence, the methods of siegecraft and, often, the results changed. For example, the methods employed in the sieges of Calais in 1346–47 and 1436 were very different. In 1449–51, the fortified positions in English-held Normandy and Gascony fell rapidly to Charles VII of France's stronger army, not least his impressive train of cannon. Charles, however, essentially relied on intimidation. This method was common in the Hundred Years War where garrisons were small and the chance of a relief force showing up unlikely. An attacker would negotiate the surrender of the inhabitants, usually in two weeks' time. If a relief army arrived or the defenders could anticipate that one would arrive then there was no surrender and no surrender would be accepted by the attackers, who would resort to bombardment. If surrendering, the garrison could leave with its belongings, promising not to fight for two to three months. If not, then the garrison would forfeit their lives once the fort was taken. This system usually worked: Henry V did this across Normandy and the Ile de France in 1415–17 (only Caen and Rouen did not surrender within two weeks), as did Joan of Arc and the Bastard of Orléans along the Loire in 1429. The English in 1415–17 and the French in 1429 both had impressive artillery trains.



SIEGE OF CONSTANTINOPLE, BYZANTINE EMPIRE Formidably protected by walls erected in the fourth and fifth centuries, notably the double line of the Theodosian Walls, Constantinople was only besieged successfully in 1204 and 1453, but there were many unsuccessful sieges, including in 626, 674–78, 717–18, 813 and 1422. This illustration comes from *A Synopsis of Byzantine History, 811–1057* by John Skylitzes (d. 1101), which covers the period from 811 to 1057. The defenders were helped by Greek fire, a combustible compound emitted by a flame-throwing weapon, particularly against ships, notably in thwarting the Arab sieges of

674–78 and 717–18.



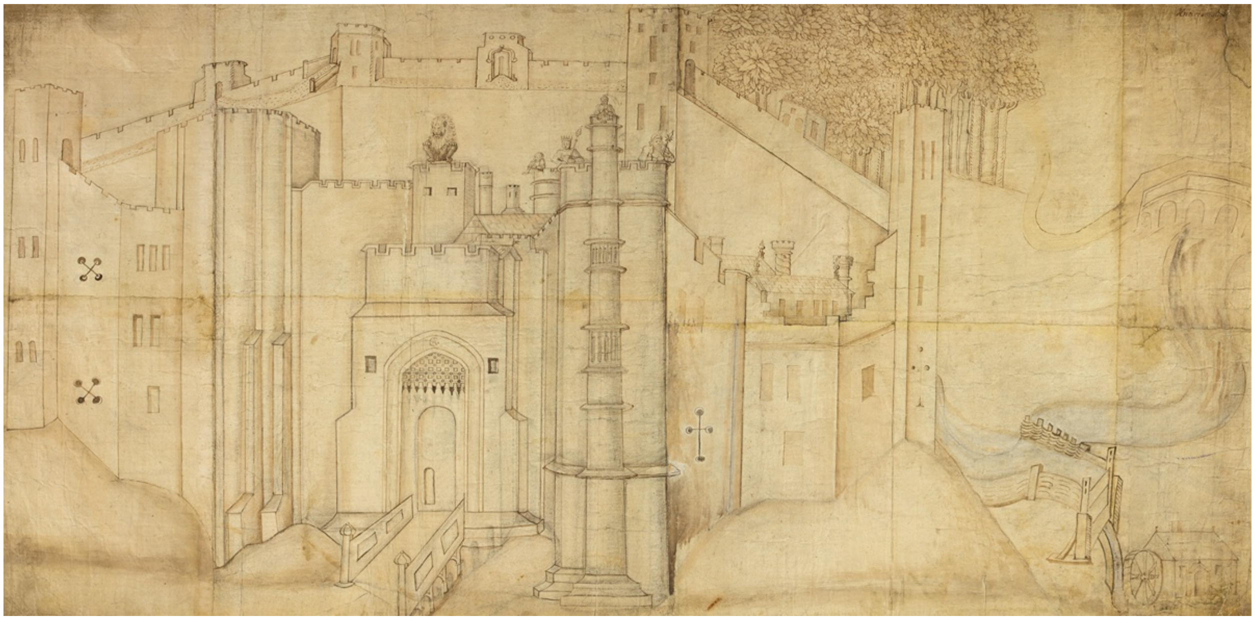
MARCHER CASTLES, ENGLAND AND WALES The ‘Three Castles’ – Skenfrith, Grosmont and White – in and near the River Wye were built to cement English control of this border area with Wales. Castles were built both by the English Crown and by Norman aristocrats seeking to expand their power. On a pattern to be seen in the American West during the nineteenth century, castles provided refuge from Welsh riders. Lightly armed cavalrymen linked to castles were one remedy. Fortifications always need active defensive personnel in order to play anything other than a passive defensive role. As shown here, Skenfrith, initially earthworks with timber defences, was rebuilt in stone at the end of the twelfth century.

In turn, fortification architecture developed, part of the process by which improvements were countered. Indeed, cannon and fortifications were in a counterpointed tension, with effectiveness in part dependent on developments in the latter. At the same time, fortification and siegecraft involved far more than responses to cannon. For example, fifteenth-century sieges in Italy indicated the importance of the spirit and commitment of the combatants and the availability of good infantry for storming the breaches, rather than gunpowder weaponry. The same has always been the case.

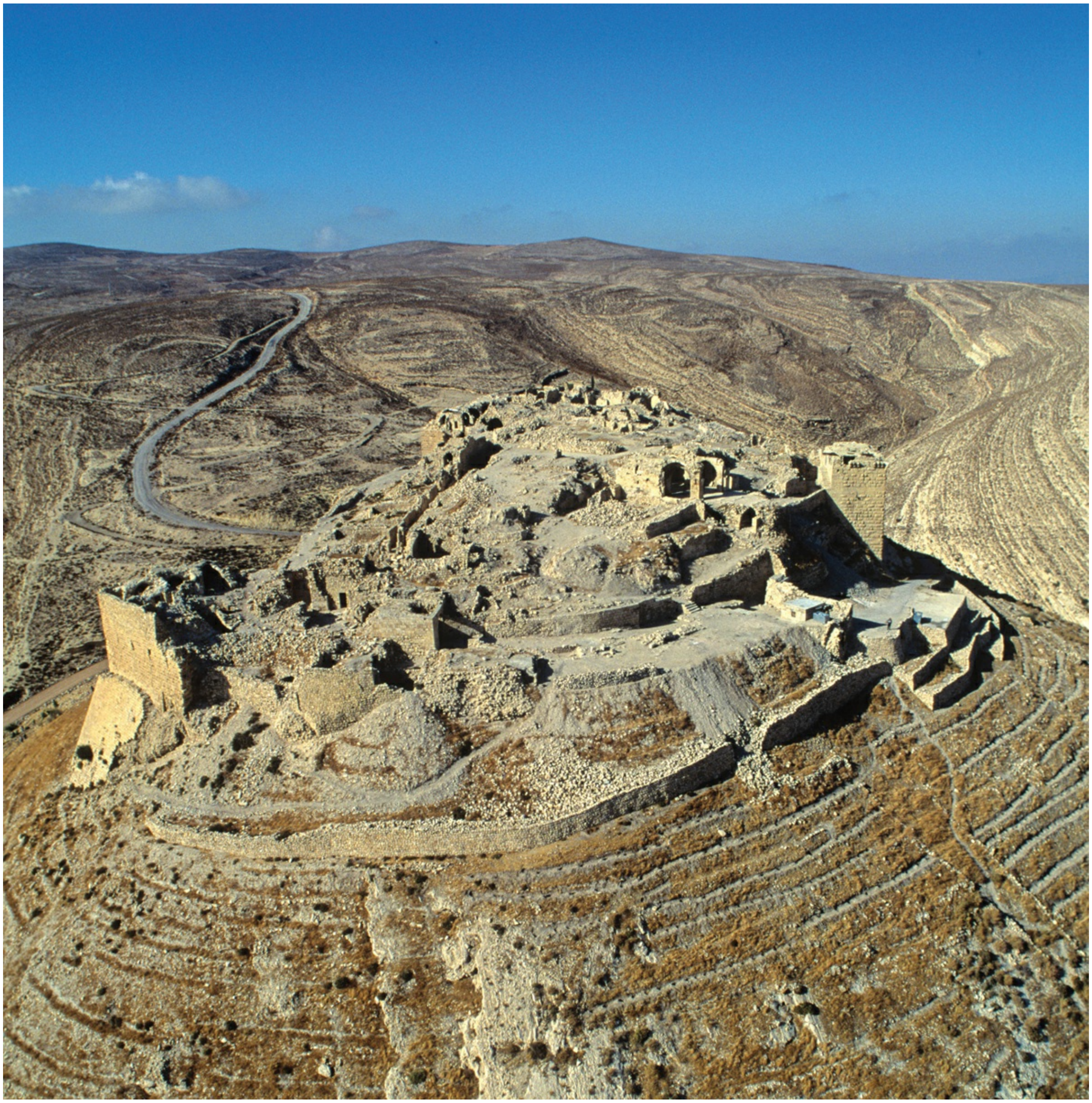
WAGON FORTS

There are several possible routes to 'modernity' in fortification. The wagon forts of the Hussites of Bohemia in the fifteenth century, and those seen in the Islamic world in the sixteenth century, as used by the Ottomans (Turks) at Chaldiran against the Safavids (Persians) in 1514, may appear an anachronism that looks back to the Hittites of antiquity. Later examples, for example as employed in the American West or by the Boers in South Africa, both in the nineteenth century, may support this approach. However, these wagon forts were forerunners of more recent field defences, providing both an obstacle and protection, as well as 'pop-up' forts, with a mobility and cost that avoided many of the issues with fixed fortifications while also offering a solution to the problem of slow-firing gunpowder weapons.

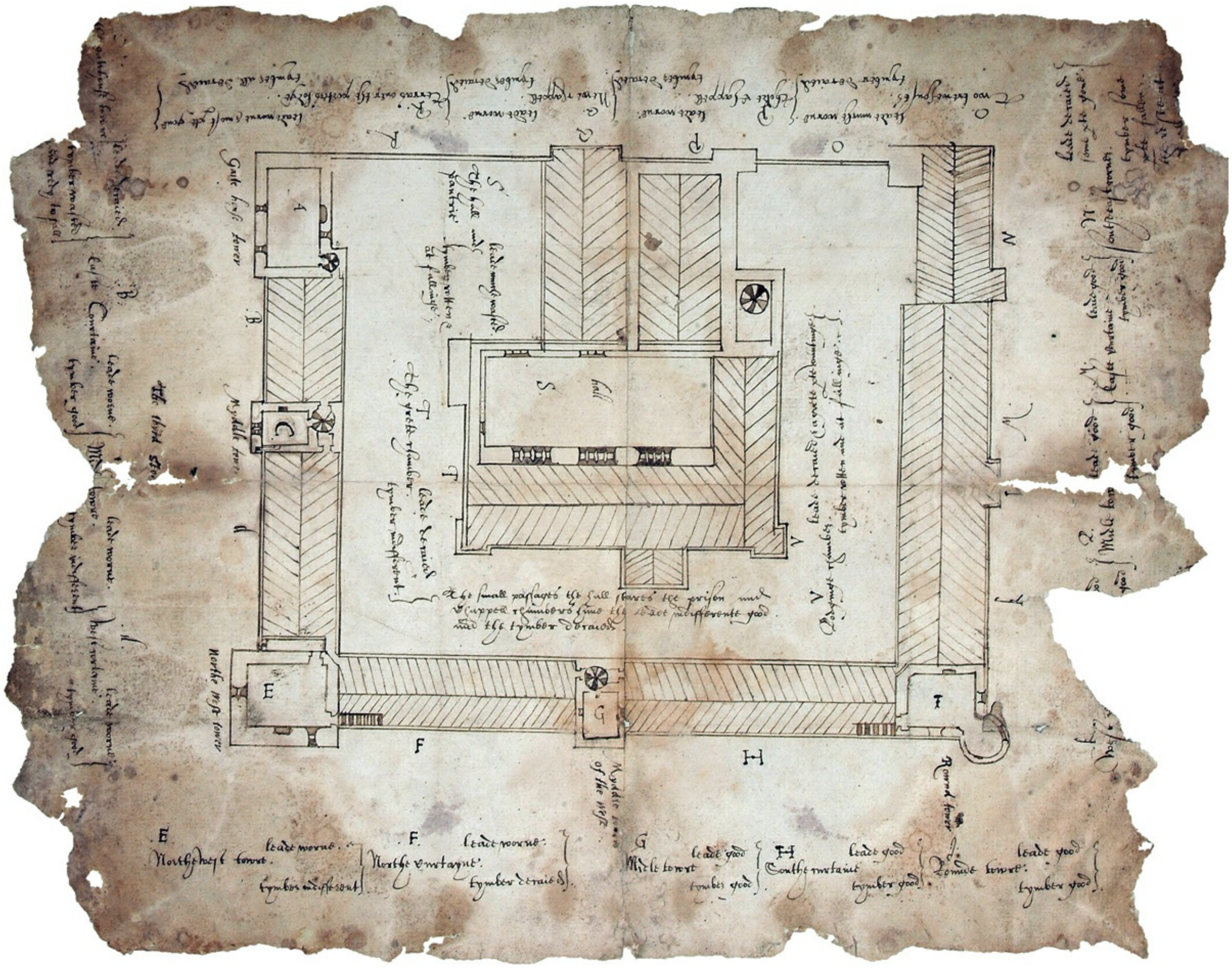
At Chaldiran, the Ottoman defences blocked the attack by the Safavid cavalry, providing opportunities for the deadly defensive fire of Ottoman infantry and cannon. Sultan Selim I, the Grim, won a major victory as a result. Ottoman tactics at Chaldiran were similar to those of the Ottomans at Baskent (1473), Raydaniyya (1517) and Mohacs (1526), at the expense of the Türkmen, Mamluks and Hungarians respectively, as well as to the Mughal tactics at Panipat (1526) and Kanua (1527), and the Safavid tactics at Jam (1528). The winning side employed a deployment known in Turkish as *tábúr cengí*: a row of carts linked by chains was arranged across the centre to block the advance of the opposing force and, behind it, both artillery and infantry were deployed. Mounted archers were placed on the wings. The vital Ottoman addition to the notion of a wagon fort, long familiar to the Turko-Mongols of Central Asia, was firepower. Babur, the Mughal conqueror of northern India in the 1520s, borrowed the tactic, as did Ivan IV (the Terrible) of Russia, helping him to total victory over the Crimean Tatars, a cavalry army, at Molodi in 1572, although success in close-quarters fighting was also important.



KNARESBOROUGH CASTLE, ENGLAND, 1561 Built in about 1100 on a strong position above the River Nidd in Yorkshire, the castle was strengthened by King John in the 1200s, and by Edward I and Edward II in the 1300s. This provided both a base for operations further north into Scotland and a protection against the Scottish raids south that became troublesome in the 1310s. Captured by Parliamentarian forces in 1644, the castle was slighted in 1648. The castle contained a keep, two baileys and a wall that included towers. This illustration accompanied a survey of castles in the north of England in 1561 by Sir Ambrose Cave, a loyal supporter of Elizabeth I who was Chancellor of the Duchy of Lancaster and a commissioner for the northern ports.



MONTREAL CASTLE, SHOUBAK, JORDAN The castle was built in 1115 by Baldwin I of Jerusalem during his expedition to the area, where he captured Aqaba on the Red Sea in 1116. Strategically located on a hill along the pilgrimage and caravan routes from Syria to Arabia, it was successfully besieged by Saladin in 1189, but the hilly site made it impossible to use siege engines. In the long siege, the defenders suffered from shortages of food and water.


Gate house towre
C
Myddle towre
hall
S
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E
Northe west towre
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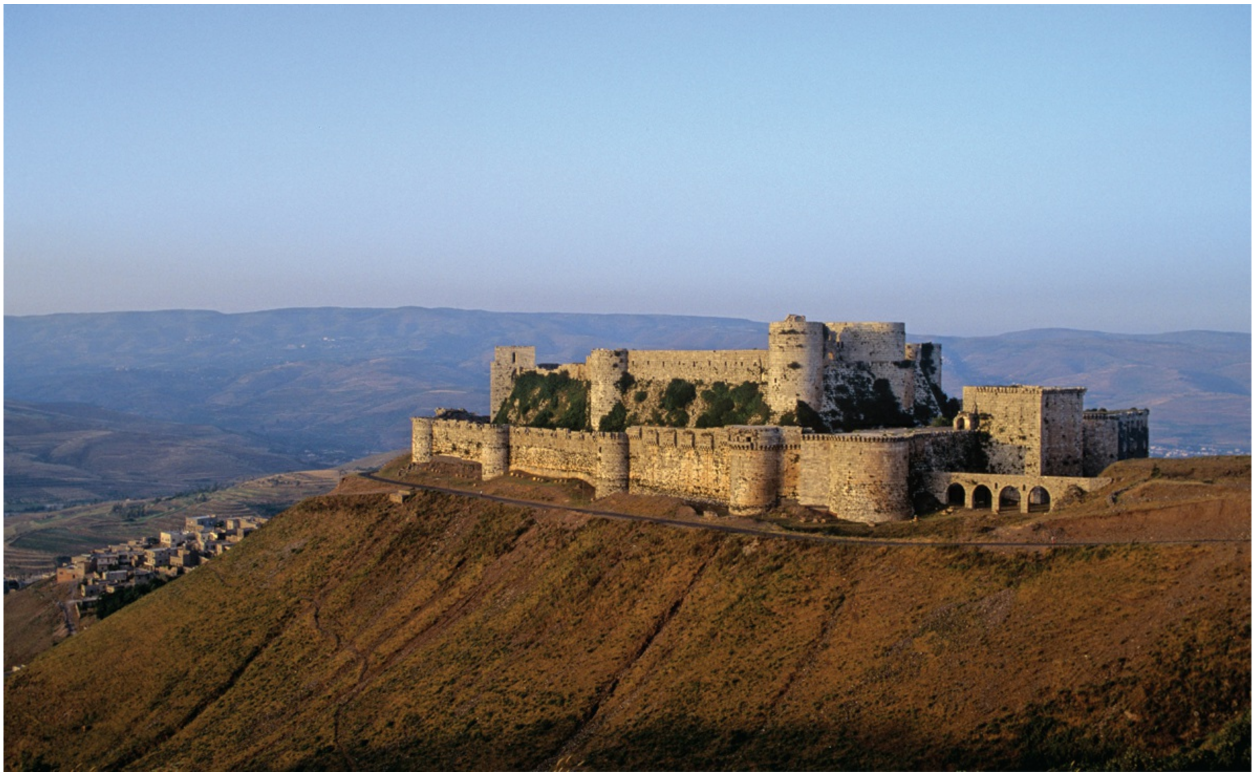
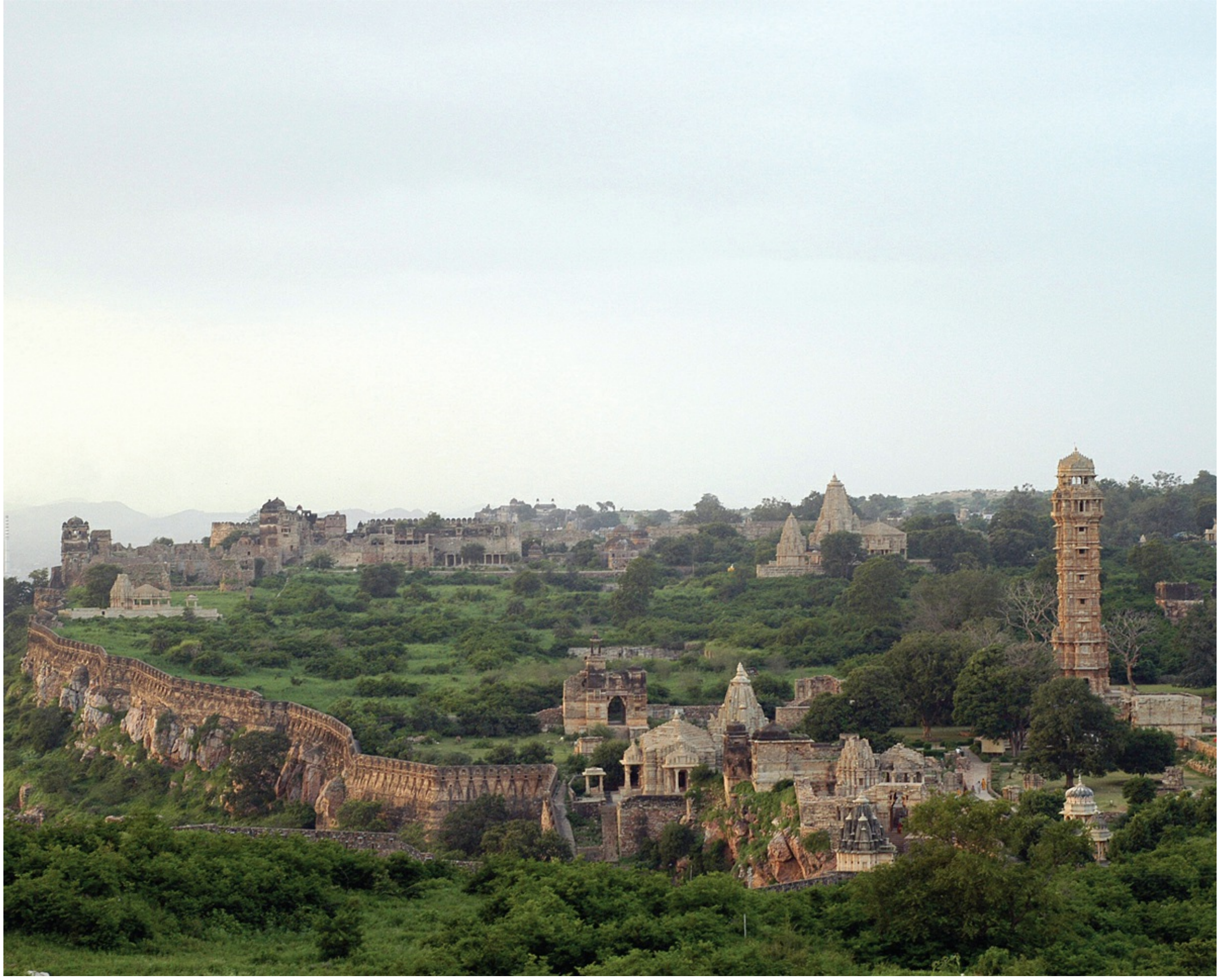
G
Myddle towre of the west
H
Round towre
E Northe west towre. leade worne. tymber indifferent
F Northe curtaynt. leade worne. tymber decaied
G Midle towre leade good tymber good
H Southe curtaine leade good tymber good
Rounde towre. leade good tymber good

MIDDLEHAM CASTLE, ENGLAND Built in Yorkshire from 1190 near the site of an earlier motte-and-bailey castle, this stone castle fell into disuse in the seventeenth century. A square keep surrounded by a later, thirteenth-century, curtain wall was the basic plan, with residential ranges added to the curtain wall.

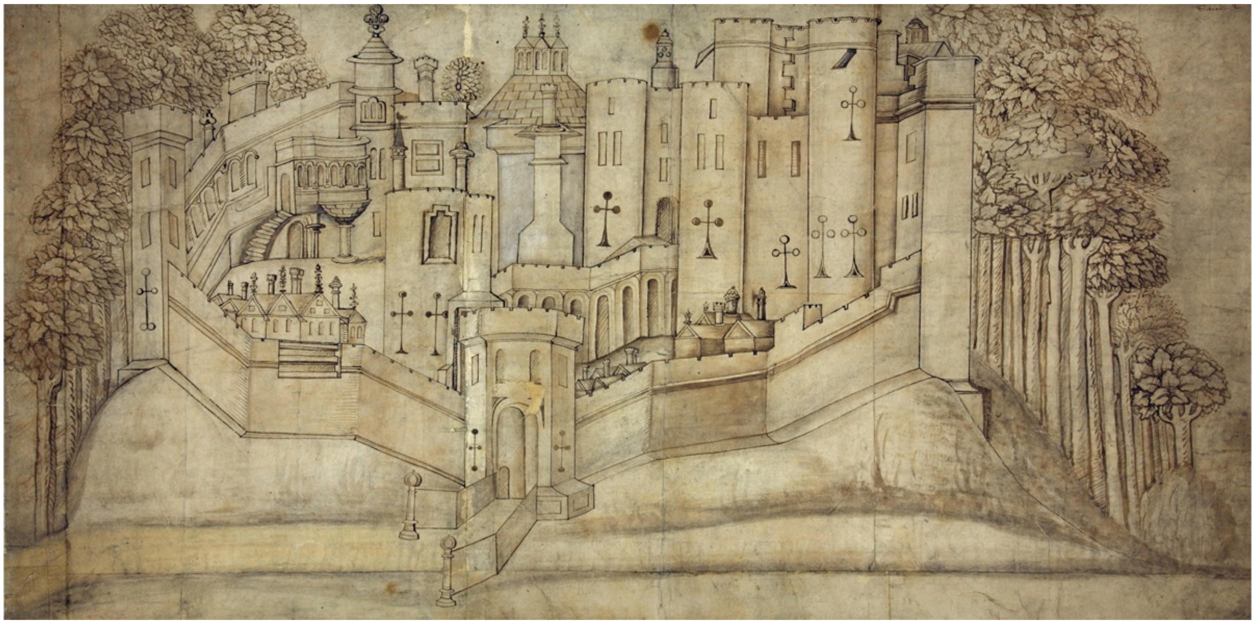


KRAK DES CHEVALIERS, SYRIA Given to the Knights Hospitaller in 1142, Krak remained in their possession until 1271. The Hospitallers began rebuilding the castle in the 1140s, but the completed works were damaged in an earthquake in 1170. The order controlled a number of border castles in the County of Tripoli, which had been founded after the First Crusade. Krak was a centre of administration as well as a military base and managed to hold out against Saladin in 1188, unlike the majority of Crusader bases.

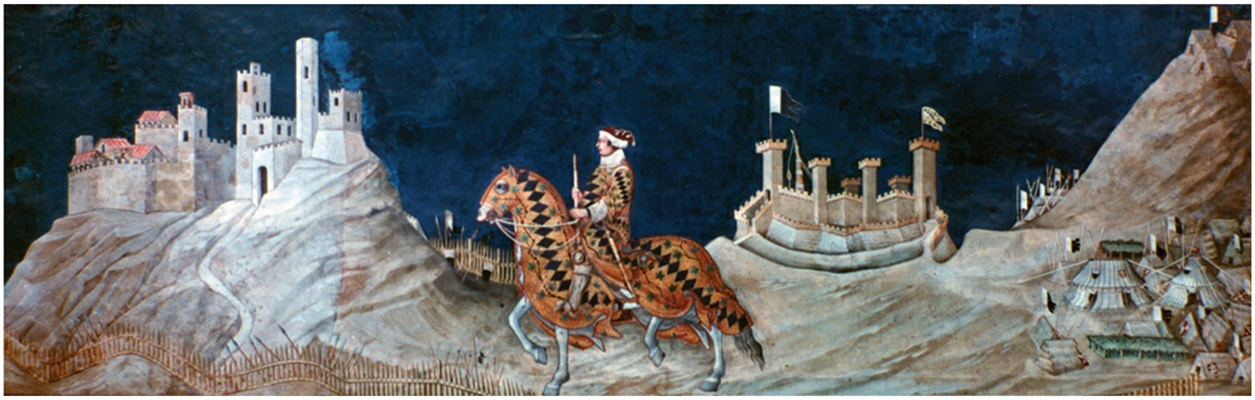
In the thirteenth century, Krak became a concentric castle after new construction created the outer wall and strengthened it with semicircular protruding towers. At its peak, the castle housed a garrison of around 2,000, which exacted tribute from a wide area. In 1271 the Mamluk Sultan, Baybars, captured Krak after a 36-day siege. The Hospitallers’ surrender was supposedly caused by a forged letter purporting to be from their Grand Master.



AERIAL VIEW OF CHITTAURGARH (CHITTOR) FORT IN RAJASTHAN, INDIA One of the largest forts in India, 180m high and spread over 280ha, the fort precinct comprises historical palaces, gates, temples and two prominent commemorative towers. It was ruled by the Paramara dynasty from the ninth to the thirteenth centuries. In 1303, after an eight-month siege, the ruler of Delhi, Alauddin Khalji, defeated Rana Ratan Singh's forces at the fort. In 1535, the fort was taken over by Bahadur Shah, the Sultan of Gujarat, after defeating Bikramjeet Singh. In 1567–68 Akbar, the Mughal ruler, captured the fort after resorting to bombardment and the digging of mines, which produced breaches through which the city was stormed.

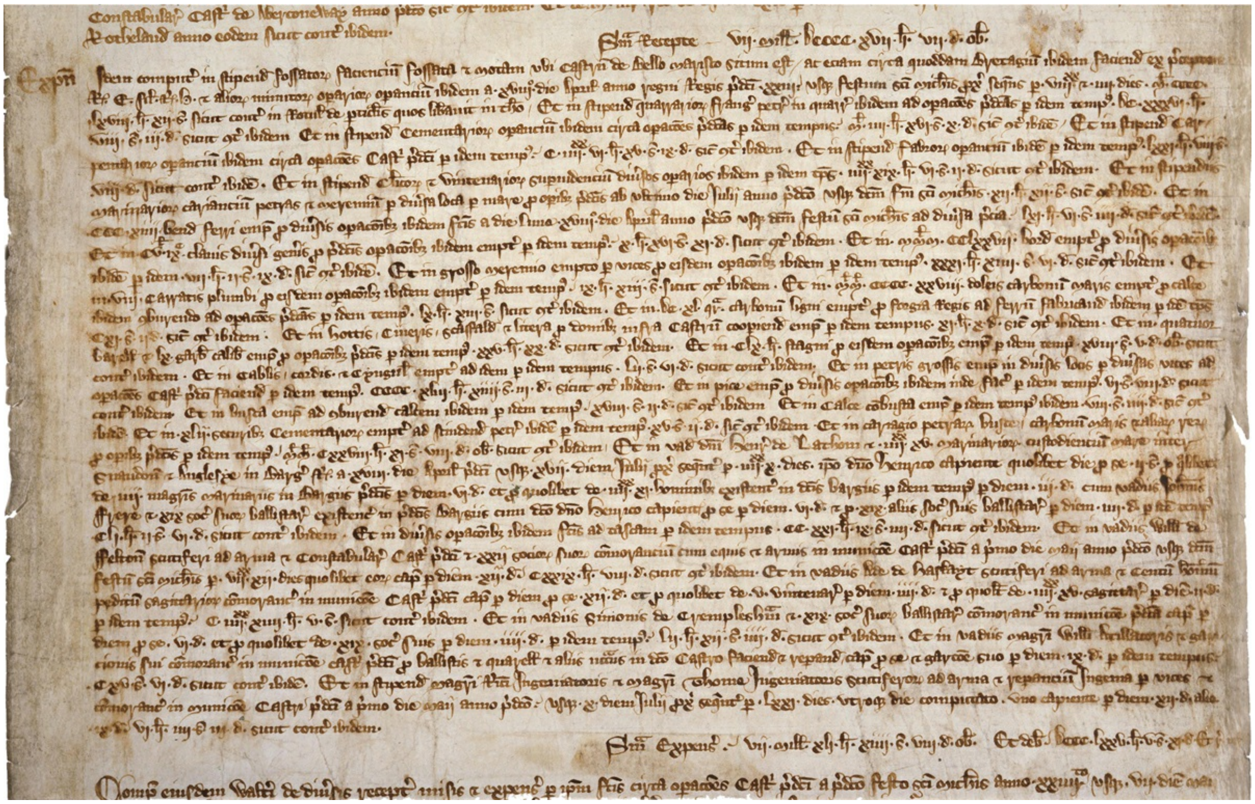


SANDAL CASTLE, ENGLAND, PERSPECTIVE VIEW, 1561 In Wakefield, Yorkshire, overlooking the River Calder, the castle was originally built in the early twelfth century by William de Warenne, 2nd Earl of Surrey, a prominent noble who, after initially backing Henry I's elder brother Robert, Duke of Normandy, eventually became a prominent supporter of Henry. It was a motte-and-bailey castle with wooden palisades and towers. From the 1160s, the timber was replaced by stone. A stone keep was built in the thirteenth century, as was a stone curtain wall. From the late fourteenth century, the castle was held by the Dukes of York. In December 1460, Richard, Duke of York, who sought the throne, was based at Sandal before his defeat and killing by the forces of Henry VI at the battle of Wakefield. Richard's son, Richard III, used the castle as a base in 1483–85 as he consolidated his position in the north of England. In 1645, the castle was successfully besieged by the Parliamentarians who slighted it in 1646. From a survey of 1561.

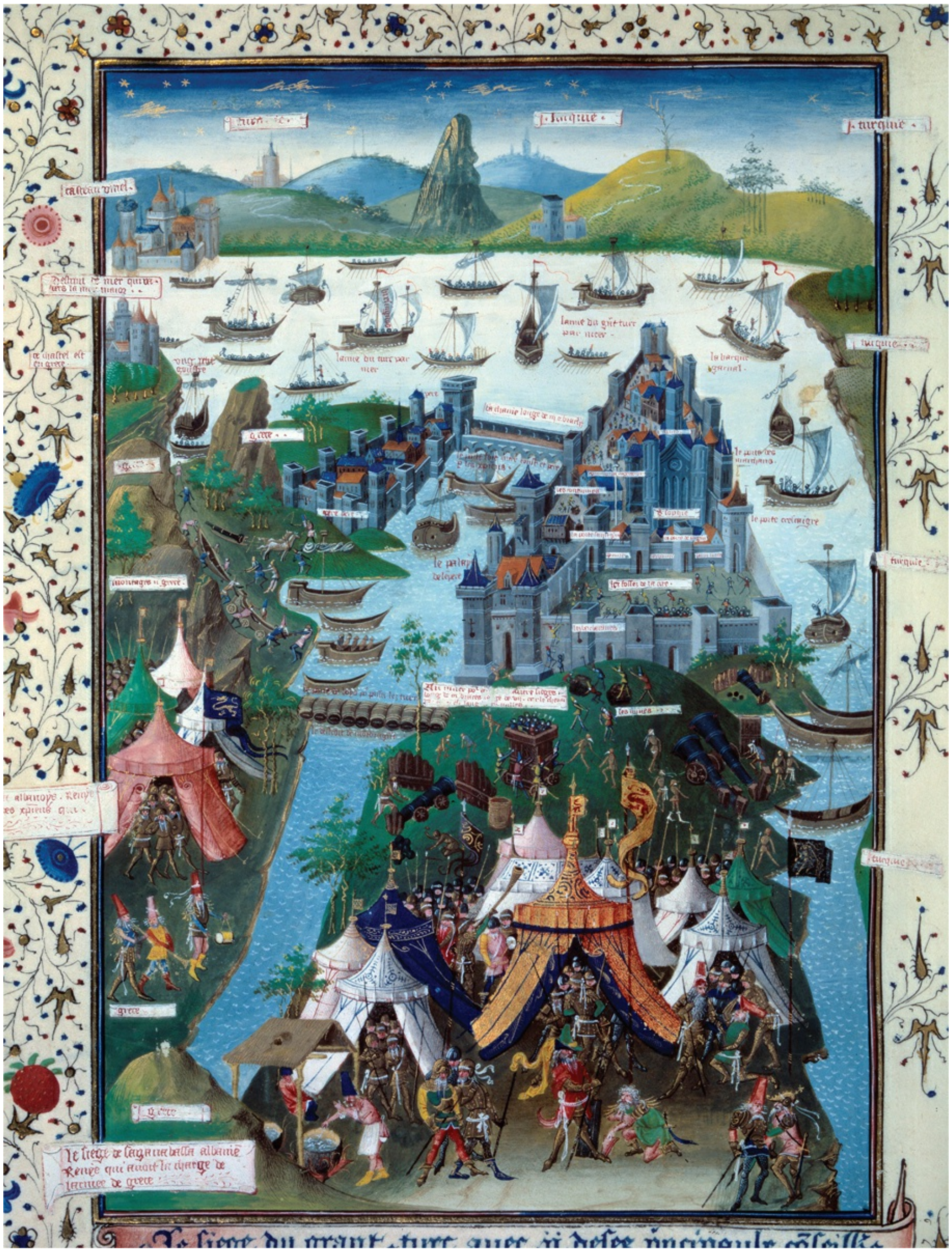


GUIDORICCIO DA FOGLIANO AT THE SIEGE OF MONTEMASSI, ITALY, 1328 Pictured here in a painting by

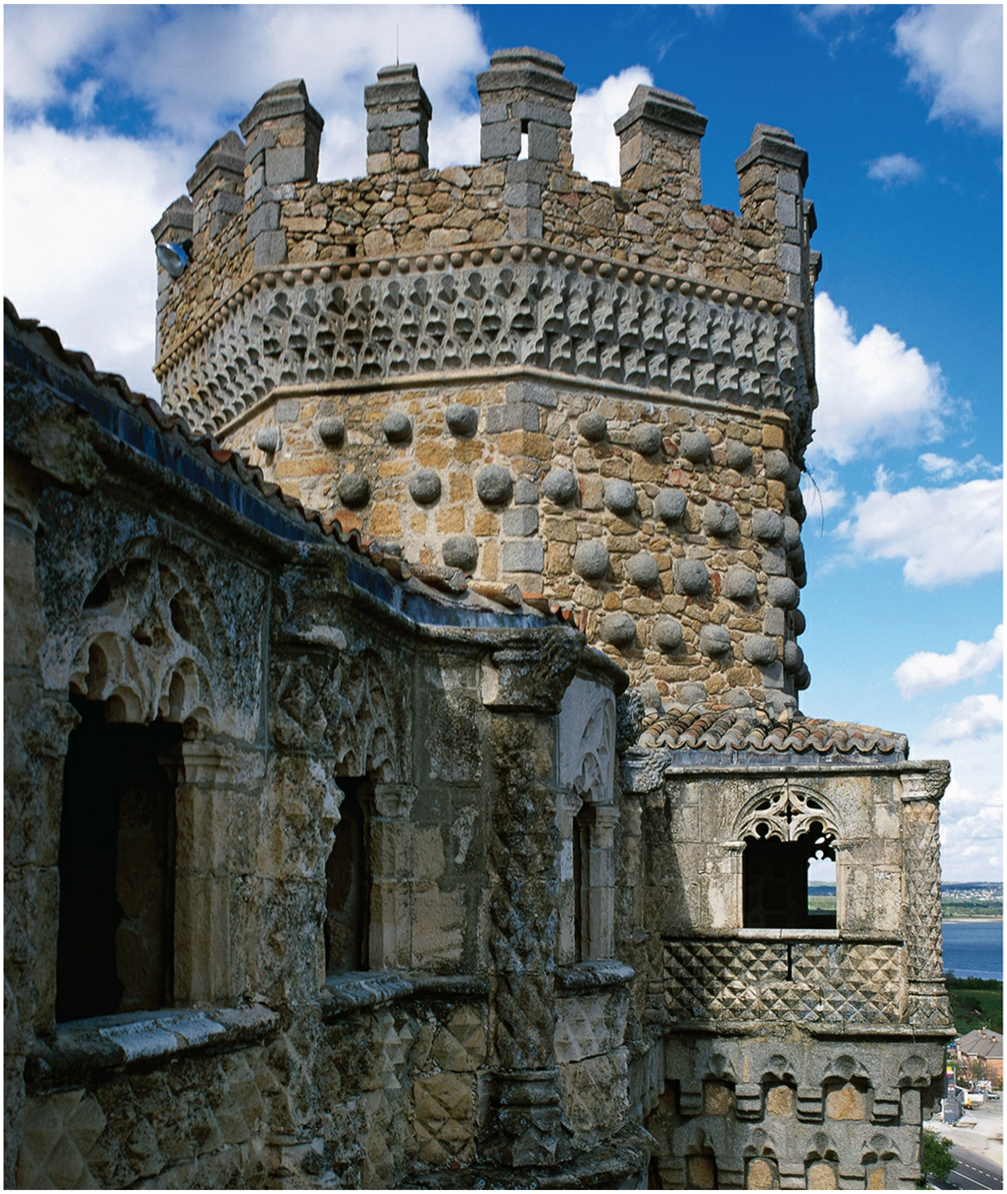
Simone Martini, Fogliano was commander of the Sienese troops. Montemassi had been captured by Sienese troops in 1328. Montemassi originated as a fortified village, and the fresco shows the importance to defence of terrain features. This is a consistent feature of fortification albeit one that has been influenced by developments in weaponry and their consequences for both defence and attack.



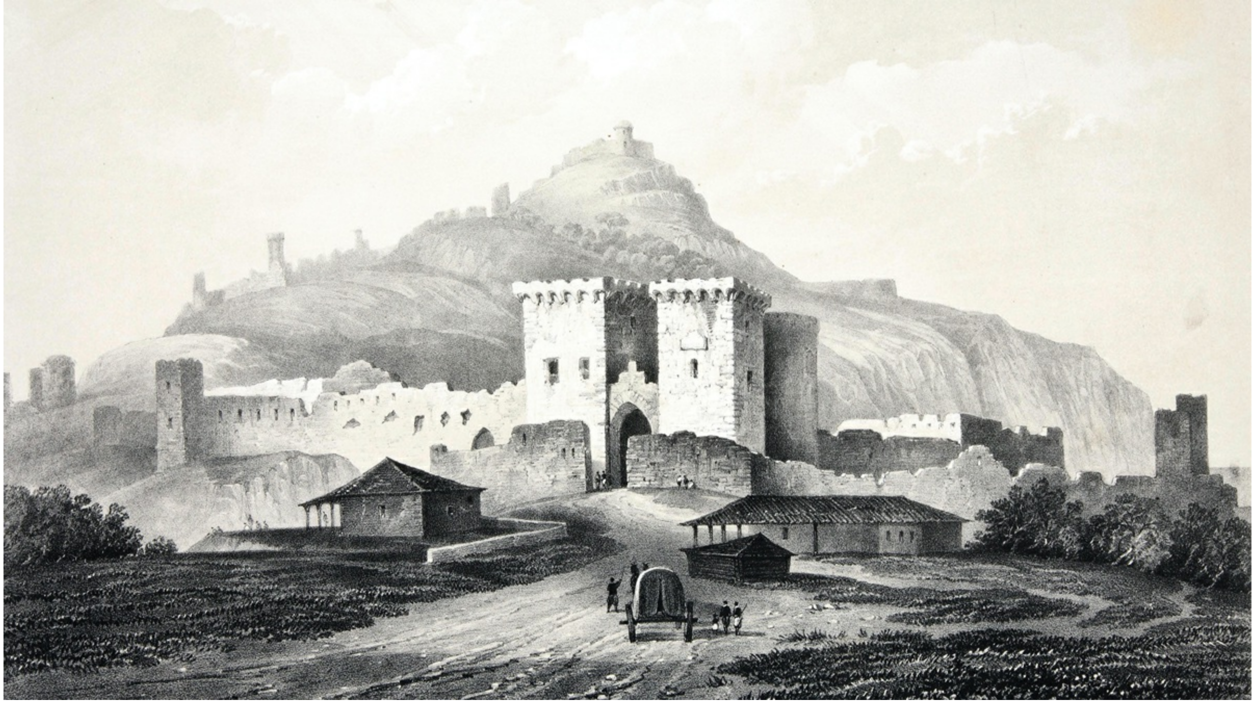
BUILDING ACCOUNTS FOR BEAUMARIS CASTLE, WALES, 1312–13 After the suppression, in 1295, of the rebellion of Madog ap Llywelyn, Edward I began his delayed plans to establish a fortified position on the island of Anglesey. The chosen site, Beaumaris, was near the town of Llanfaes, a major port. Its Welsh population was moved away, and an English town, protected by a castle, was established. The architect was Master James of St George, the ‘Master of the King’s Works in Wales’. The work he organised was recorded in considerable detail in the Pipe Rolls. Work was stopped in 1300 due to a focus on Edward’s wars in Scotland, but resumed from 1306. In total £15,000, a formidable sum, was spent by the time work finished in 1330. The castle was captured by Welsh rebels in 1403 during the Owen Glendower rebellion but retaken in 1405 by royal forces.


turquie
grece
le siege de lagauaballa albanie
Renye qui auoit la charge de
larmee de grece
Le siege du grant turc auec ii de ses

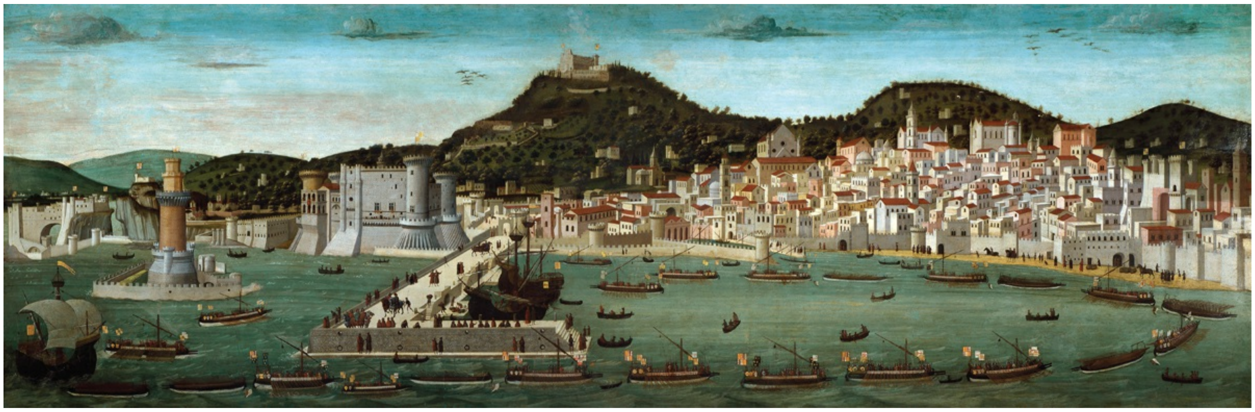
THE SIEGE OF CONSTANTINOPLE, 1453 Ottoman cannon played a role in Mehmed II's success, but numerical superiority (about 100,000 to maybe 8,000 troops) was crucial in the 54-day siege. The artillery, including about 60 new cannon cast at the effective foundry of Adrianople (Edirne), drove off the Byzantine navy and battered the walls, creating breaches through which the city was stormed, with Emperor Constantine XI dying in its defence. The Ottoman capital moved to Constantinople, while Mehmed took the sobriquet 'the Conqueror'.



MANZANARES EL REAL, SPAIN, 1475 Fortifications were generally built in response to specific threats. In the War of the Castilian Succession (1475–78), Isabella, who became ruler in 1474, was backed by Aragon (she was already married to her cousin Ferdinand, the heir apparent of Aragon) and most of the aristocracy and clergy, while her rival, her eventually unsuccessful half-niece Joanna, was supported by Portugal (she was married to Alfonso V) and some of the major aristocracy. Work on a new castle in Manzanares el Real was begun in 1475 by Diego Hurtado de Mendoza, 1st Duke of the Infantado, a supporter of Ferdinand and Isabella. A palace castle, it reflected the status of the family.

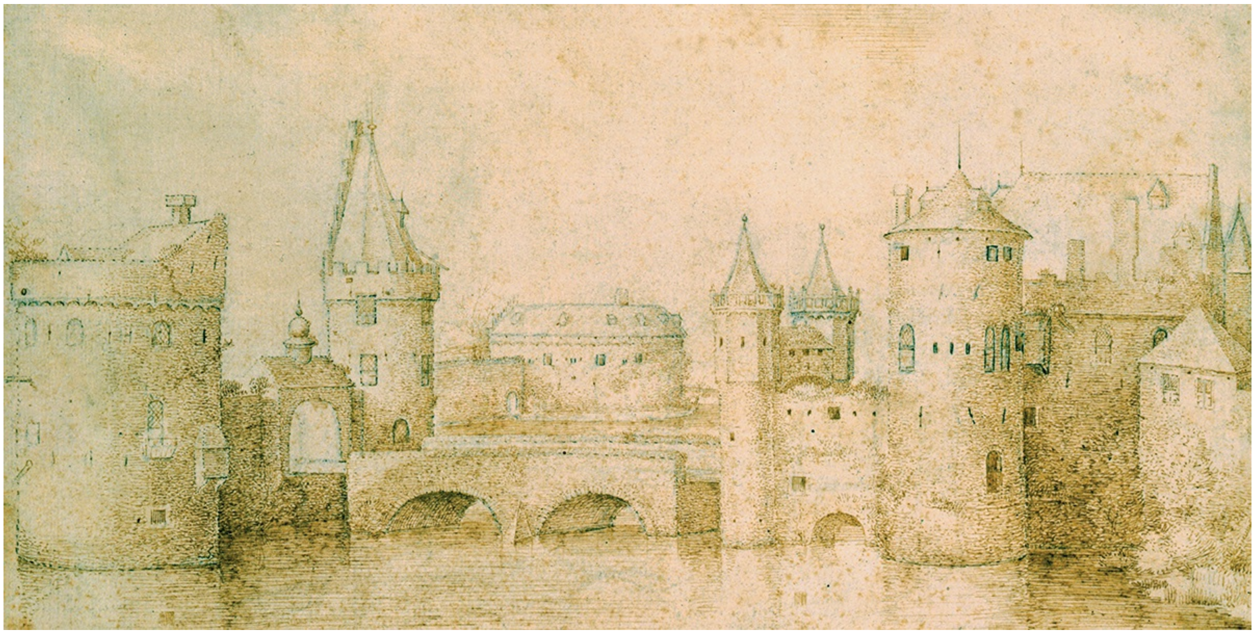


SUDAK, CRIMEA A Crimean city seized from the Tatars by the Genoese in 1365 and held by them until captured by the Ottomans in 1475 after a long siege. The Genoese had refortified the city, constructing the citadel that is still visible today. The illustration reflects British interest during the Crimean War (1854–56).



THE SIEGE OF NAPLES, ITALY, 1495 In 1495, the invading army of Charles VIII of France arrived in Naples. The bombardment of the Castel Nuovo, still an impressive position, was ineffective. Ten days of cannon fire inflicted only limited damage, and the French ran short of iron balls and gunpowder. The surrender of the garrison reflected exhaustion and division, not the inexorable pressure of cannon fire.

THE SIXTEENTH CENTURY



The spread and increasing sophistication of cannon became much more of a factor in the attack on fortifications, and their defence in the sixteenth century, although the situation varied greatly across the world. When the Spaniards arrived in Manila Bay in the Philippines in 1572, the local communities were defended only by a bamboo stockade at the entrance to the Pasig River, and only one stone fort is known to have existed in the Philippines before the Spaniards arrived.

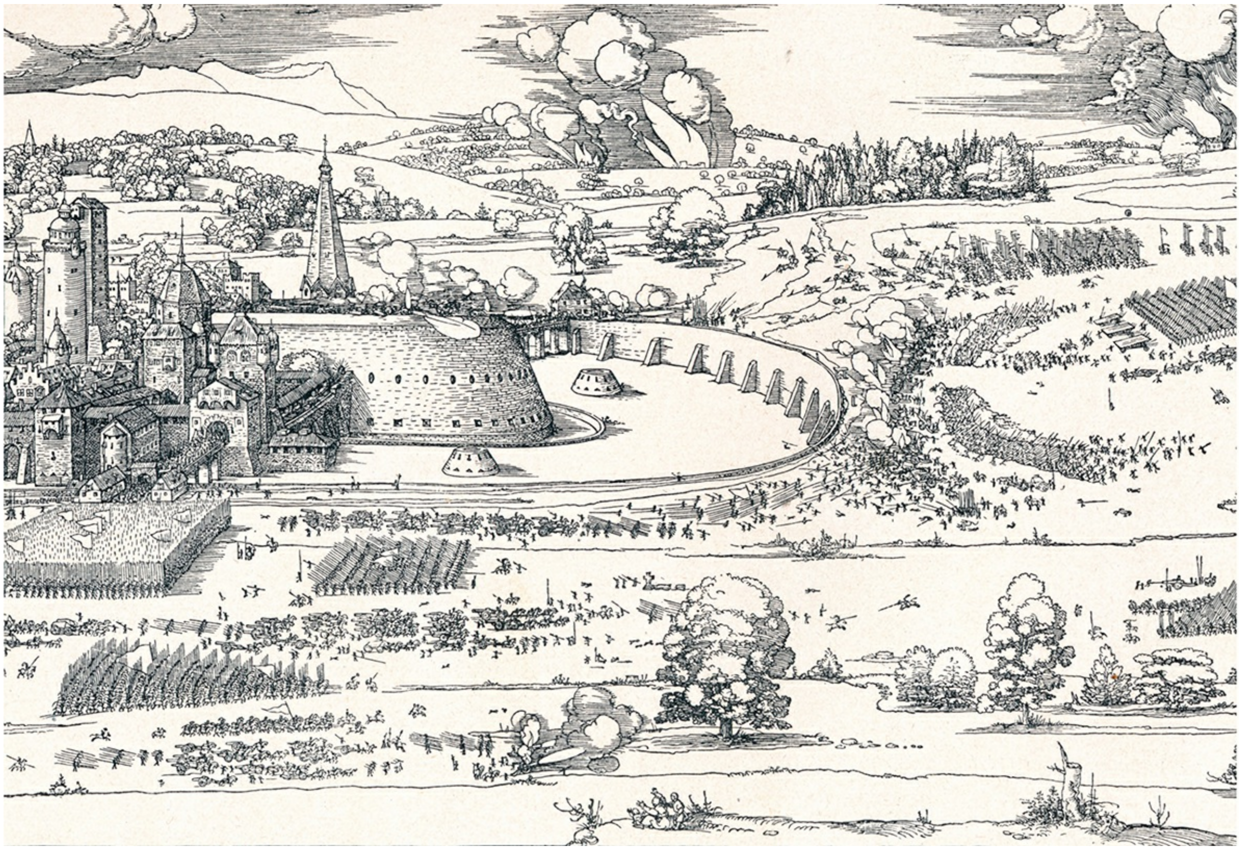
In Christian Europe, in a very different context, cannon were most effective from the fifteenth century and, even more, the sixteenth, against the stationary target of high stone walls. As a result, fortifications were redesigned to provide lower, denser and more complex targets. There were developments and adaptations to resist cannon prior to the better-known system *alla moderna* (more recently called the *trace italienne*), including adding masonry reinforcements to existing towers and sloping skirts at the base of walls. The boulevards used, as at the siege of Orléans in 1429, were earth and timber outworks constructed to keep the besiegers from running their cannon close to the walls.

Nevertheless, fortifications designed to cope with artillery were first constructed in large numbers in Italy and were then spread across Europe by Italian architects. In this new system, bastions, generally quadrilateral or pentagonal, angled, and at regular intervals along all walls, were introduced to keep the besieger from the inner walls and to provide gun platforms able to launch effective flanking fire against attackers. Cannon were placed on the ramparts, which helped ensure that the defence could be active. The use of planned fire zones by the defence was more important than the strength brought by height, whether of position or of walls. Defences were lowered and sunk in ditches, obliging the attacker to expose their batteries, and the defences, strengthened with earth to minimise the impact of cannon fire, were slanted to help defeat cannonballs. There were similar designs in Japanese castles. These improvements in fortifications lessened the impact and decisiveness of artillery in siegecraft.

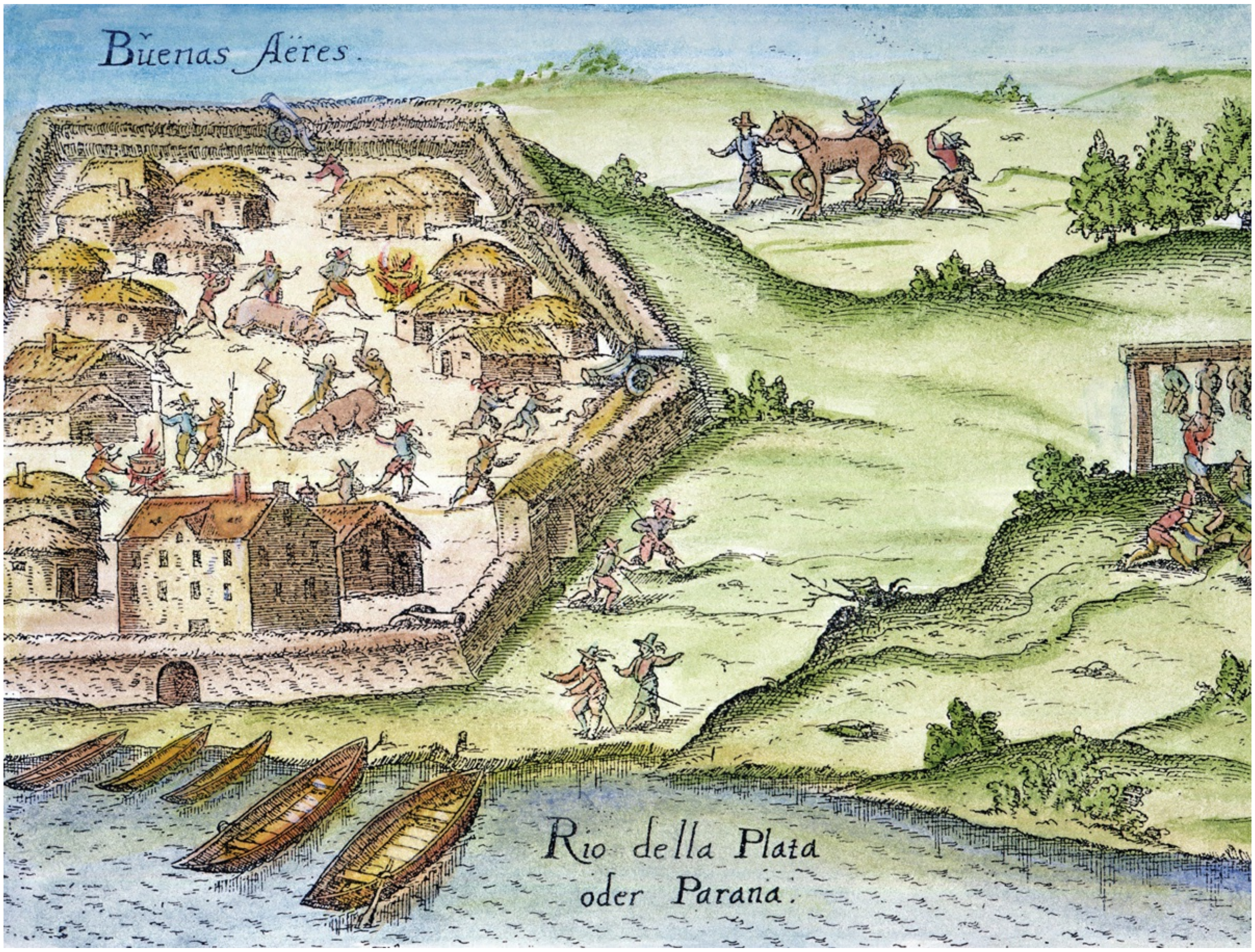
The often-cited idea that cannon brought the value of medieval fortifications to an end, and thus brought the medieval military system to a close, requires qualification. Even when cannon were moved up to take part in sieges, itself a difficult process in the transport system of the age, they were frequently only marginally more effective than previous means of siegecraft.

Indeed, cannon initially failed more often than they succeeded, and many times a castle fell to treachery or negotiation, rather than bombardment. In addition, stormings, rather than sieges, were also important, as during the Italian Wars, when the French stormed Venetian-held Brescia in 1512.

Nevertheless, with the demise of the siege tower and the battering ram, siege operations in 1550 were different to those of two centuries earlier and were far more focused on cannon. At the successful English siege of Boulogne in 1544, more than 250 pieces of heavy ordnance were deployed, including mortars firing exploding cast iron balls. The introduction and effects of gunpowder weapons were gradual processes, more akin to evolution than the overused term revolution. Similarly, in response to gunpowder, there were a number of much cheaper ways to enhance existing fortifications than the system *alla moderna*, and these other methods were used much more extensively. As is always the case, most positions were not fortified at the scale and expense of the best-fortified locations. As a result, most sieges did not match the major and lengthy efforts mounted against the latter. Examples of such efforts included the eventually successful efforts mounted by Spain, in opposing the Dutch Revolt, against Antwerp in 1585 and Ostend in 1601–04, both well-defended as well as strongly fortified.



THE SIEGE OF A FORTRESS, BY ALBRECHT DÜRER, 1527 In 1527, Dürer published a treatise on fortification that proposed walls dominated by massive squat roundrels, towers that would also provide gun platforms. Strengthened by earth and timber, such squat towers were better able to take bombardment than high walls. This indicated that not everyone adopted the Italian *alla moderna* system of low, bastioned defences.


Buenas Aëres.
Rio della Plata
oder Parana.

BUENOS AIRES, ARGENTINA, 1595 The South American city was founded in 1536 by Pedro de Mendoza, a Spanish noble, who had set sail in 1534 with the support of the Crown. This illustration comes from a 1595 account of his expedition. The fortified walls are shown, as is the use of cannon to support the defence. Attacks by the indigenous people forced the settlers away. Abandoned in 1542, the site was re-established in 1580 by Juan de Garay, Captain General of the Viceroyalty. In fortifying distant bases, colonists had to respond to the need for speed and to the availability of the local building materials. Buenos Aires was defended by a quickly assembled one metre thick wall made of mud, but it did not prove resistant to the rain.

The largest new fortifications in Europe, those at Smolensk in Russia built between 1597 and 1602, were built in the traditional fashion with a high stone wall 6.5 kilometres long and 13–19 metres high, strengthened by towers. The vulnerability of high stone walls, however, meant that such fortifications were increasingly regarded as anachronistic. Indeed, Smolensk's walls were breached by the besieging Poles in 1611 and by the Russians, when they recaptured it in 1654.

In general, fortifications were of most value when combined with field forces able to relieve them from siege. Indeed, many campaigns revolved around attempts to mount sieges and, in response, to relieve besieged positions. As a result of the latter, sieges led to major battles such as Pavia (1525), Nördlingen (1634) and Rocroi (1643). Sieges, moreover, were frequently determined not by the presence of wall-breaching artillery, but by the availability of sufficient light cavalry to blockade a fortress and dominate the surrounding country. Sieges accentuated the logistical problems that were so difficult for contemporary armies, as besieging forces had to be maintained in the same area for a considerable period, thereby exhausting local supplies.

Other factors were also involved in fortification, and in the campaigning linked to it. In terms of significance of power, the demonstration of force by means of fortifications could be more important than their specific usefulness in action. So also in attacks on fortresses. Thus, many sieges ended not with particular operations, but with a surrender in the face of a larger besieging army. This was a relationship that could be almost ritualistic in its conventions, and not only in Europe.

EXPANSION WITH THE AID OF FORTS

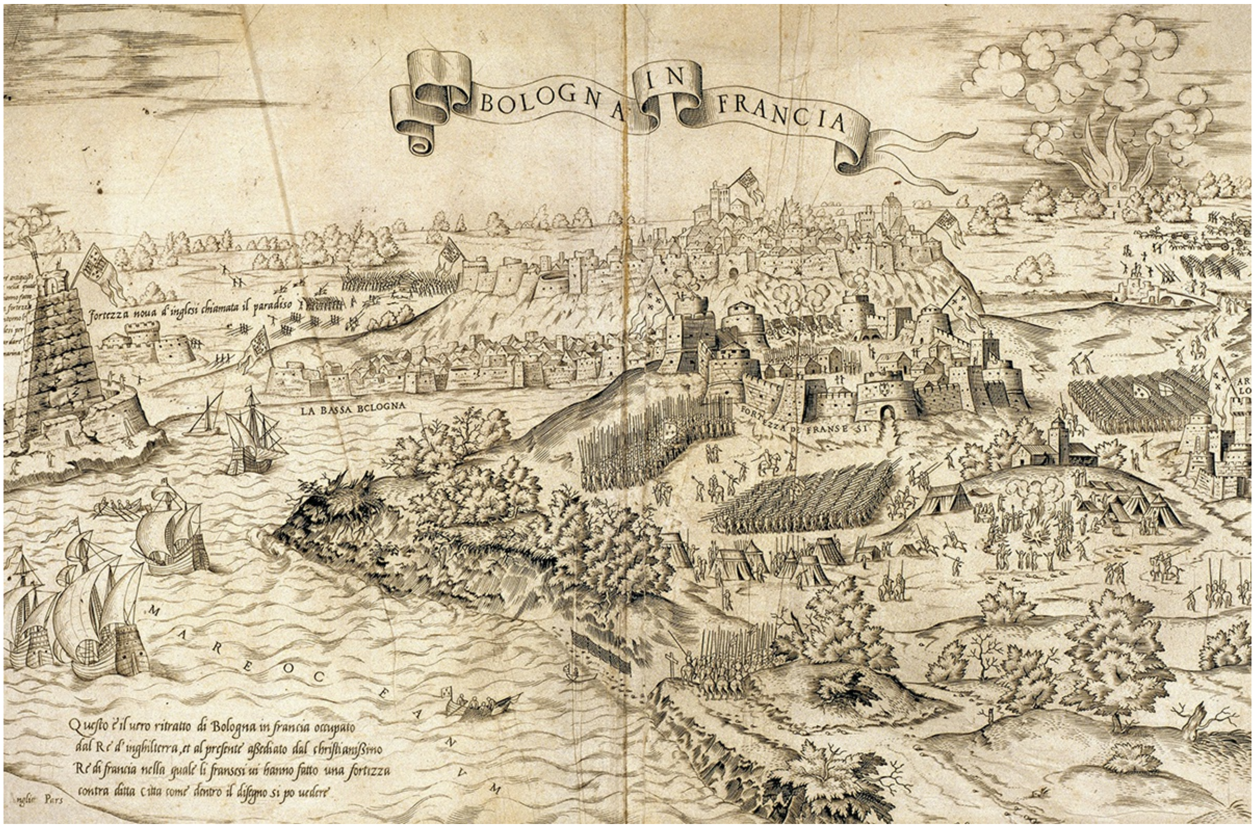
Outside Europe, Western expansion was anchored by fortresses. This was seen across the oceans and with the eastward expansion of Russia. In the latter case, forts were established at Samara and Ufa in 1586, and then, across the Urals, at Tyumen in 1586 and at Tobolsk, on the River Ob, in 1587. In their expansion, the Russians did not face fortresses in Siberia, but they did when they attacked Islamic opponents, notably the khanate of Kazan. This was a key target for Ivan IV, 'the Terrible' (r. 1533–84). Kazan, long an opponent of Russia, not least as a source of slave-raiding by light cavalry, stood on a high bluff overlooking the Volga River. It had double walls of oak logs covered over with clay and partially plated with stones. These were formidable defences, even if they did not match the defences of the *alla moderna*. There were 14 stone towers with cannon and a deep surrounding ditch. Such ditches posed an obstacle to attackers, accentuated the height of the defensive walls, and made it much harder to undermine them. This factor remained a constant with fortifications.

The garrison of Kazan consisted of 30,000 men with 70 cannon, which was both a formidable force and the main army of Kazan, although there was also a light cavalry army, about 20,000 strong, that sought to harass the besiegers. Ivan attempted two winter campaigns against Kazan in 1547–48 and 1549–50, but these failed because the Russian army had no fortified base in the region, had to leave its artillery behind because of heavy rains, and ended up campaigning with an exclusively cavalry army that was of no use in investing the fortress of Kazan.

But for the third campaign, a base was secured. In the winter and spring of 1551–52, the Russians prefabricated fortress towers and wall sections near Uglich and then floated them down the Volga on barges with artillery and troops to its confluence with the Sviiaga, 25 kilometres from Kazan. Here, the fortress of Sviiazhsk was erected in just 28 days, providing a base. That summer, siege guns and stores were shipped to Sviiazhsk and a Russian army, allegedly 150,000 strong, with 150 siege guns, advanced, reaching Kazan on 20 August. The Russians constructed siege lines from which cannon opened fire and used a wooden siege tower carrying cannon, which moved on rollers. The ditch surrounding the city was filled with fascines and sappers tunnelled beneath the walls. The mines were blown up on 2 October, destroying the walls at two of the gates, upon which the Russian army, drawn up into seven columns, attacked all seven of the gates simultaneously. They soon broke through, and Kazan fell with a massive slaughter of the defenders. The furthest north of the Islamic khanates had fallen. Ivan exploited his success by moving down the Volga valley to capture Astrakhan in 1556 and to establish Russian power on the Caspian Sea. Thus, the capture of a major fortress had major and lasting strategic consequences for Russia and its neighbours.Overseas, the European powers were similarly dependent on fortifications. This was the case with both Portuguese and Spanish expansion, and subsequently with that of England, France and the Dutch. With limited manpower, the Portuguese Empire depended on the combination of fortified positions, notably citadels at ports such as Goa, Malacca, Mombasa, Mozambique and Muscat, with warships that used these ports. Spain was in a similar situation, although, alongside fortifications at ports such as Veracruz, Havana, St Augustine and Cartagena, more of its fortifications protected inland centres of government, such as Mexico City.

OTTOMAN FOCUS ON MOBILITY

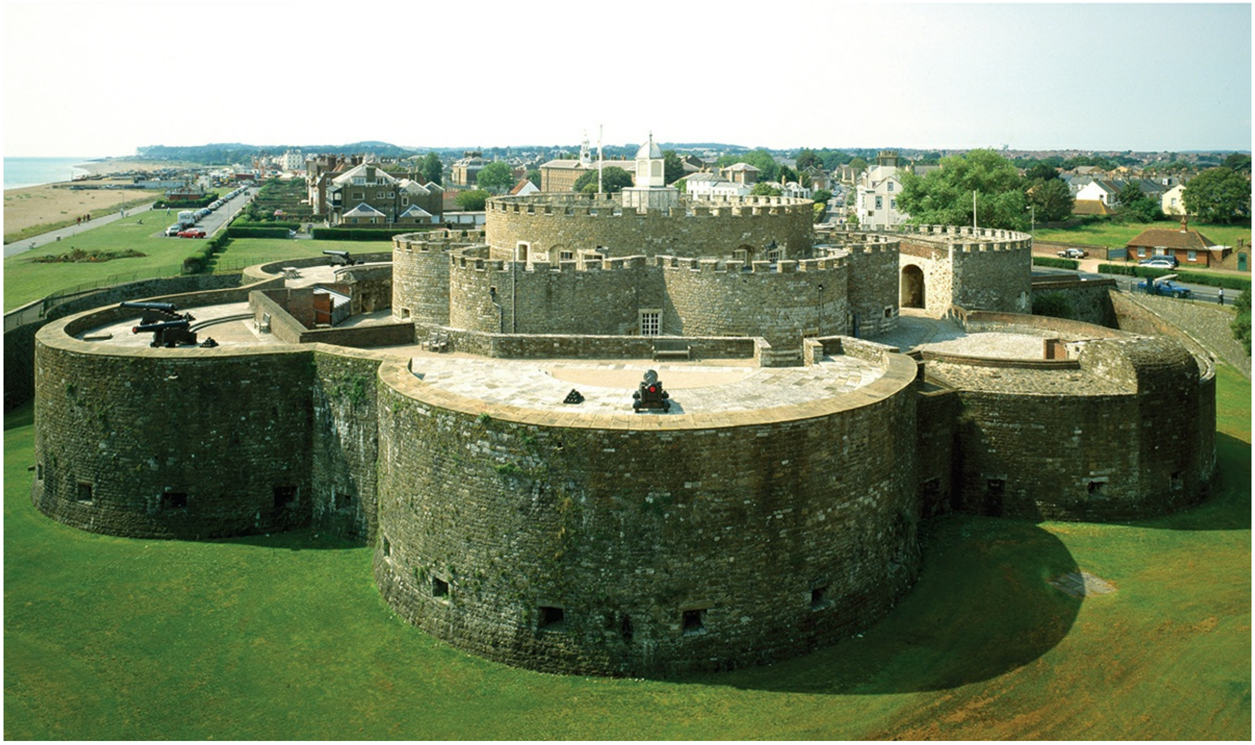
That the Ottomans (Turks) did not have a fortification re-evaluation equivalent to that of the Western Europeans, in expenditure or style, was not so much due to a failure to match Western advances, as because the Ottomans scarcely required such a development as they were not under attack. Moreover, the Ottoman emphasis on field forces and mobility, as well as their interest in territorial expansion, ensured that they were less concerned with protecting fixed positions. In contrast, Western losses of fortresses to the Ottomans early in the sixteenth century, such as Modon (1500), Belgrade (1521), and Rhodes (1522), as well as a lack of confidence in mobile defence, encouraged the introduction of the new angle-bastioned military architecture, which the Venetians were very quick to use in their empire. The Ottomans deployed 22 cannon and two mortars against Modon, firing 155–180 shot daily.


BOLOGNA IN FRANCIA
Fortezza noua d'inglesi chiamata il paradiso
LA BASSA BOLOGNA
FORTEZZA DI FRANSESI
MARE OCEANVM
Queſto è il uero ritratto di Bologna in francia occupato dal Re d'inghilterra, et al preſente aſsediato dal christianiſsimo Re di francia nella quale li franſesi ui hanno fatto una fortizza contra ditta citta come dentro il diſegno si po uedere
Anglie Pars

SIEGE OF BOULOGNE, FRANCE, 1544 Henry VIII's attempt to expand the English position in the Pas de Calais led to the siege of Boulogne from 19 July. The lower section of the town fell rapidly, but the upper town proved more difficult and was put under bombardment, as shown here. Its walls were eventually breached and when the English dug tunnels under the castle, the French surrendered on 13 September. The English had deployed more than 250 pieces of heavy ordnance, including mortars firing exploding cast-iron balls. The following month, a French assault on Boulogne was beaten back. The English then heavily fortified Boulogne, beating off a French attack in 1549, but in 1550 it was returned to France as a result of negotiations.

In 1529, the Ottomans were less successful when they attacked Vienna, the walls of which were 300 years old. Niklas von Salm conducted a vigorous defence, showing how fortifications could be rapidly enhanced and expanded at times of need. The energy and skill with which this was done was a key element in any successful defence and should not be detached from discussions of fortifications or treated as inherently secondary. Salm blocked Vienna's gates, reinforced the walls with earthen bastions and an inner rampart, and levelled any buildings where it was felt to be necessary. This defence exacerbated the problems posed for the Ottomans by beginning the siege relatively late in the year. Having withstood the assault, Vienna afterwards constructed massive, purpose-built, encircling fortifications.

When the Ottomans needed fortresses they built them, for example along the Damascus to Cairo and to Mecca roads in order to protect travellers on these important routes from attacks by Bedouin Arabs, and at the southern end of the Red Sea. In the Van region of eastern Anatolia, an area threatened by the Safavids of Persia, the Ottomans heavily fortified a line of towns around the lake. Fortifications both held off the Safavids and also served to overawe the Kurds. In 1582, a chain of seven fortresses was built on the Red Sea coast from Suakin to Massawa in order to consolidate its capture from Ethiopia. In the seventeenth century, there were also to be important Ottoman fortifications in Yemen.



DEAL CASTLE, ENGLAND An artillery fort constructed by Henry VIII of England in 1539–40, this was a response to the reconciliation of the Emperor Charles V with Francis I of France in 1538 and their agreement to act against England. Henry ordered the construction of a series of forts. Those at Deal, Sandown and Walmer were designed to protect both the anchorage of the Downs and a potential landing site on Deal Beach. The castle consisted of a keep and six bastions, and had 66 firing positions for cannon. In the event, no invasion was mounted and Henry was able to negotiate an agreement with Charles V. A later war with France led to the reinforcing of the castle in 1558. In 1648, during the Second Civil War, the Royalist-held castle was besieged by the Parliamentarians, only to surrender when news came of the Parliamentary victory over an invading Scottish army at Preston. The castle was a significant defensive site during the Napoleonic Wars.

ASIAN FORTIFICATIONS

Fortresses, moreover, played a role in Japan. The extent of instability and civil warfare in the sixteenth century encouraged fortifications. However, the need for them in turn fell as cohesion and unity were imposed. Japanese castle building responded to gunpowder by combining thick stone walls with hilltops of solid stone. Toyotomi Hideyoshi, the unifier of Japan in the 1580s and 1590s, proved successful in siegecraft, as with the fall of Odawara and other Hojo fortresses in eastern Honshu in 1590. Cannon became more important from the 1580s, but Hideyoshi's success in sieges also owed much to other factors, notably the use of entrenchments to divert the water defences offered by lakes and rivers. These entrenchments threatened fortresses with flooding by rising waters, or with the loss of the protection by water features on which many in part relied. This was more generally true of many fortresses, not least because of their role in protecting crossing places against rivers, a function that remains significant to the present day.

In India, Akbar, the expansionist and successful Mughal Emperor (r. 1556–1605), anchored his position in northern India with a number of fortresses, especially Agra, Allahabad, Lahore, Ajmer, Rohtas and Attock. Sieges were also significant. Logistics played a major role in them, while negotiations frequently accompanied sieges as part of the process by which the display of power was intended to produce a solution. Not always, however. In 1567, Akbar declared a *jihad* against Udai Singh, rana of the Rajput principality of Mewar. Initial attacks on the Mewar fortified capital of Chittaurgarh (Chittor), which stood high on a rock outcrop above the Rajasthan plain, were repulsed, and Akbar resorted to bombardment and the digging of mines: tunnels under the walls filled with explosives. The latter were especially helpful in producing breaches in the walls, although the construction of a *sasbat* (or covered way) to the walls to cover an attack was also very significant. After a night-time general attack, the city fell in 1568, with all the defenders and 20,000–25,000 civilians killed in hand-to-hand fighting. The fortress was then destroyed. Hilltop locations reflected the major value of topography to the defence and the political message of overawing offered by fortresses. Fortification *alla moderna* was introduced to India by the Portuguese, who were also probably responsible for circular bastions there, but the diffusion of these techniques was limited.

In China, the military strength of the Ming empire (1368–1644) lay more in fortifications than in firearms. The majority of the army served against the Mongols along the vulnerable northern frontier where there was a series of major garrisons in the complex known as the Great Wall. This provision became increasingly important as Mongol attacks became much more serious in the mid-fifteenth century, and then again in response to ultimately successful Manchu attacks in the early seventeenth. The Chinese sought to cope by relying on walls and on garrisons at strategic passes. As a result, terrain and topography were to be aided by fortifications.

Numbers were crucial in Chinese siege techniques. The earlier use of gunpowder in China ensured that their fortified cities had very thick walls, which were capable of withstanding the artillery of the sixteenth century and earlier. As a consequence, assault, rather than bombardment, was the tactic used against fortifications. This was also appropriate to the large forces available. The risk of heavy casualties could be accepted, a matter both of pragmatic military considerations and of cultural attitudes towards loss, suffering and discipline. Sieges had to be brought to a speedy end because of the serious logistical problems of supporting large armies, which encouraged storming attempts.

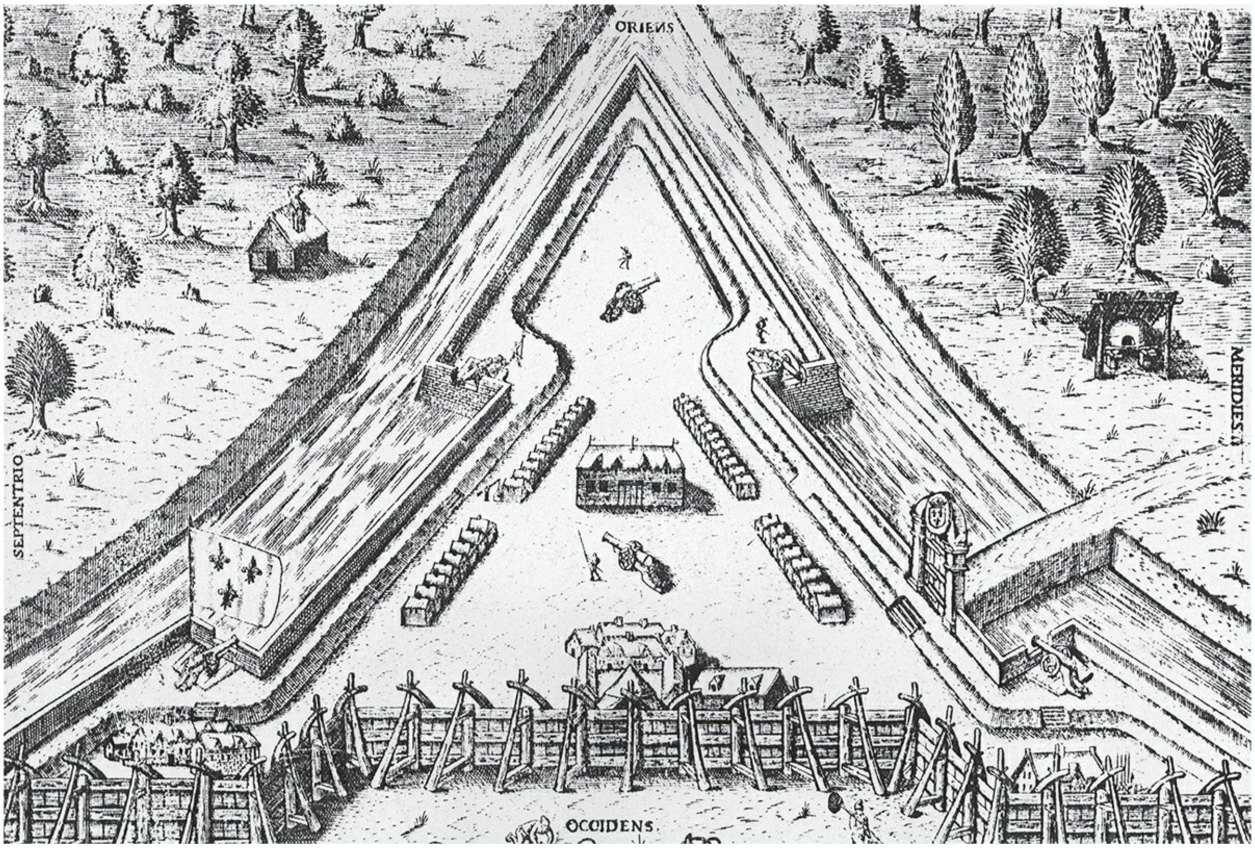
DISREPAIR AND ABANDONMENT

Alongside improvements in fortification techniques in particular areas, there was also a destruction of fortifications, deliberate or by neglect, with the latter proving especially important in the rotting of wood and the filling in of ditches and moats by debris. There was also the neglect seen in deciding not to enhance fortifications, notably to counter new developments in artillery. Moreover, governments actively sought to weaken the military resources of real and potential domestic adversaries. As a result, building fortifications could become a questionable step. Edward Stafford, 3rd Duke of Buckingham, began the construction of Thornbury Castle in 1511 when he was high in the favour of Henry VIII, but they fell out in 1521; Buckingham's construction of the castle was one of the charges in the indictment that led to his execution for treason. The castle had six towers with machicolations and a gatehouse on the late-medieval pattern. The castle was confiscated by Henry.

Social élites, notably across much of Western Europe, tended to look to the Crown and, in doing so, to abandon earlier tendencies to resist unwelcome policies by violence. For example, in England the shift from castle keep to architecturally self-conscious stately home was symptomatic of an apparently more peaceful society and a product of the heavy costs of castle building. Castles appeared to be redundant in the face of royal armies, as with the suppression of the Northern Revolt against Elizabeth I in 1569. In 1588, in response to the threat from the Spanish Armada, there were hasty preparations – cannon were mounted on castle walls; but the defences of England primarily rested on the fleet and the army.

Most fortifications in England were in a poor state. There had been an extensive abandonment of castles, in some cases from the 1470s, and far more actively under the Tudors who came to power in 1485. Dunstanburgh Castle was already much ruined in 1538 and Dunster Castle in 1542, as a consequence of a lack of maintenance for decades. In 1597, a survey found that Melbourne Castle was being used as a pound for trespassing cattle, and it was demolished for stone in the 1610s. John Speed described Northampton Castle in 1610: 'gaping chinks do daily threaten the downfall of her walls.' When, in 1617, James I visited Warkworth Castle, earlier a mighty fortress, he found sheep and goats in most of the rooms. Bramber Castle, formerly a Sussex stronghold of the Howards, was in ruins.

The major fortresses built in England during the sixteenth century were for frontier defence, and not for mounting or resisting rebellion. In particular, on the pattern of the Roman forts of the Saxon Shore, Henry VIII responded to the alliance in 1538 between the Emperor Charles V and Francis I of France, and the consequent fears of invasion by building, in the 1540s, a series of coastal fortifications on the south coast of England, including Camber, Deal and Walmer. These mounted cannon in order to resist both bombardment by warships and attack by invading forces. More generally, the anchorages on the south coast were to be protected by fortifications, for example Dartmouth Castle. The biggest single new fortified position was Berwick-on-Tweed, the principal fortress intended both to protect northern England from invasion and, more particularly, to provide a base from which attacks could be mounted on Scotland and notably on its capital, Edinburgh. The fortress also protected the anchorage in the estuary of the River Tweed. The modern new defences were very different to the castellated medieval ones there.



FORT CAROLINE, FLORIDA Founded on the banks of the St Johns River by French Protestants in 1564, the fort was captured by Spanish troops the following year in a surprise dawn attack in which the defenders were massacred. The fort was protected by the river, a wooden stockade and cannon, but was affected by hunger and attack by Native Americans. The Spaniards destroyed Fort Caroline and built their own fort on the same site, only for it to be captured and burned by a French force in 1568. Wood was plentifully available locally. Constructed by the National Park Service, a near full-scale replica can be seen on the site.

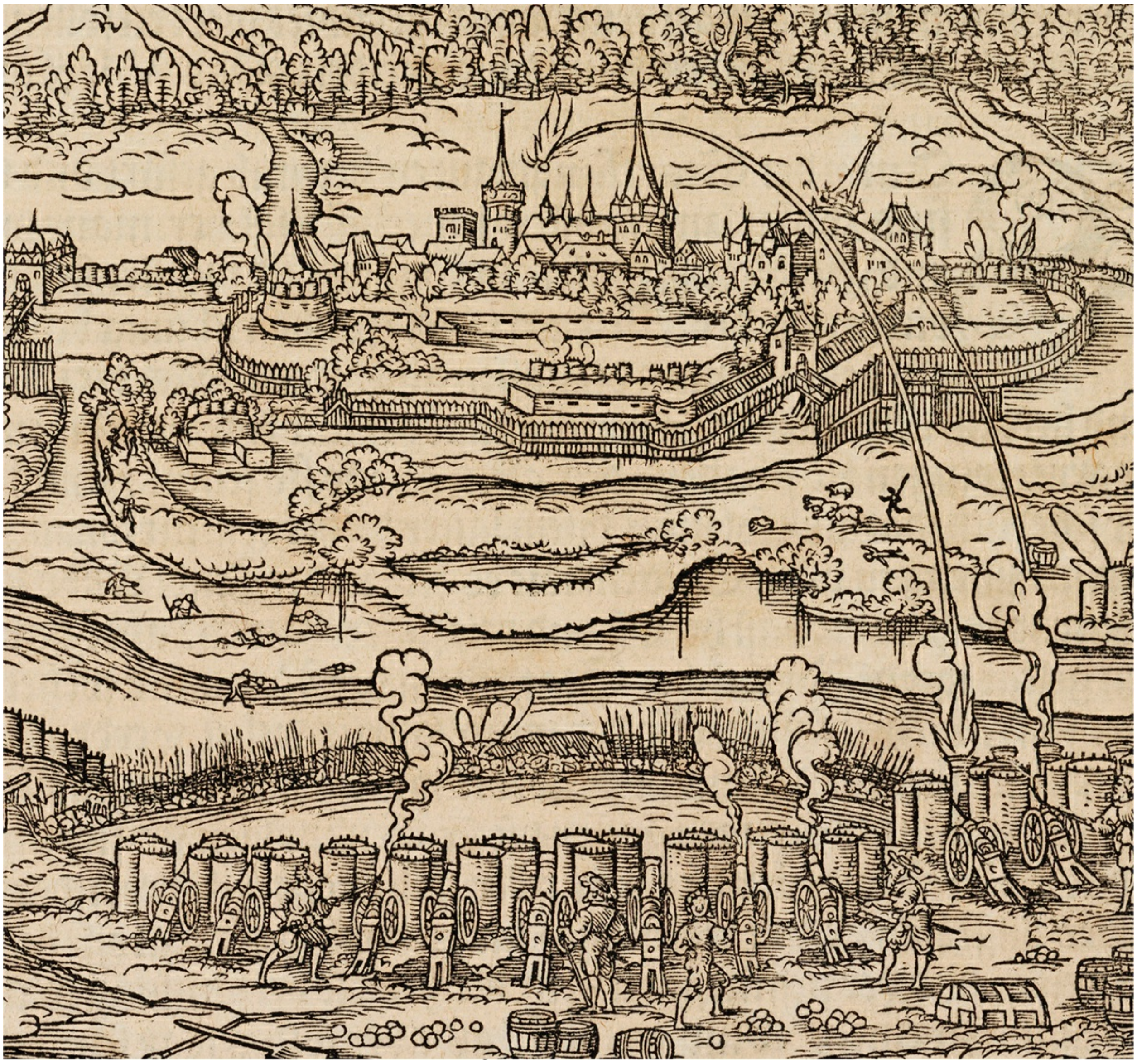
In Wales in the sixteenth and early seventeenth centuries, many castles were abandoned or, as with Beaumaris and Conwy, fell into disrepair, while others were enhanced not with fortifications but with comfortable and splendid internal 'spaces', especially long galleries, as at Raglan, Powis and Carew. It was not only in Britain that castles fell into ruin. The same was true elsewhere. Thus, in the United Provinces (Dutch Republic), new fortified positions were concentrated in frontier regions, as, in particular, at Breda, but ruined castles were recorded by painters, for example Jacob van der Croos' *Landscape with Ruined Castle of Brederode and Distant View of Haarlem.* Built in the third quarter of the thirteenth century and rebuilt a century later, the castle was set on fire by Spanish forces in 1573.

Increasingly, the new fortifications of the sixteenth century and later might provide lodgings for their garrisons, but generally were not private and domestic in the medieval tradition. Instead they were instruments of the state, as in the Roman period.

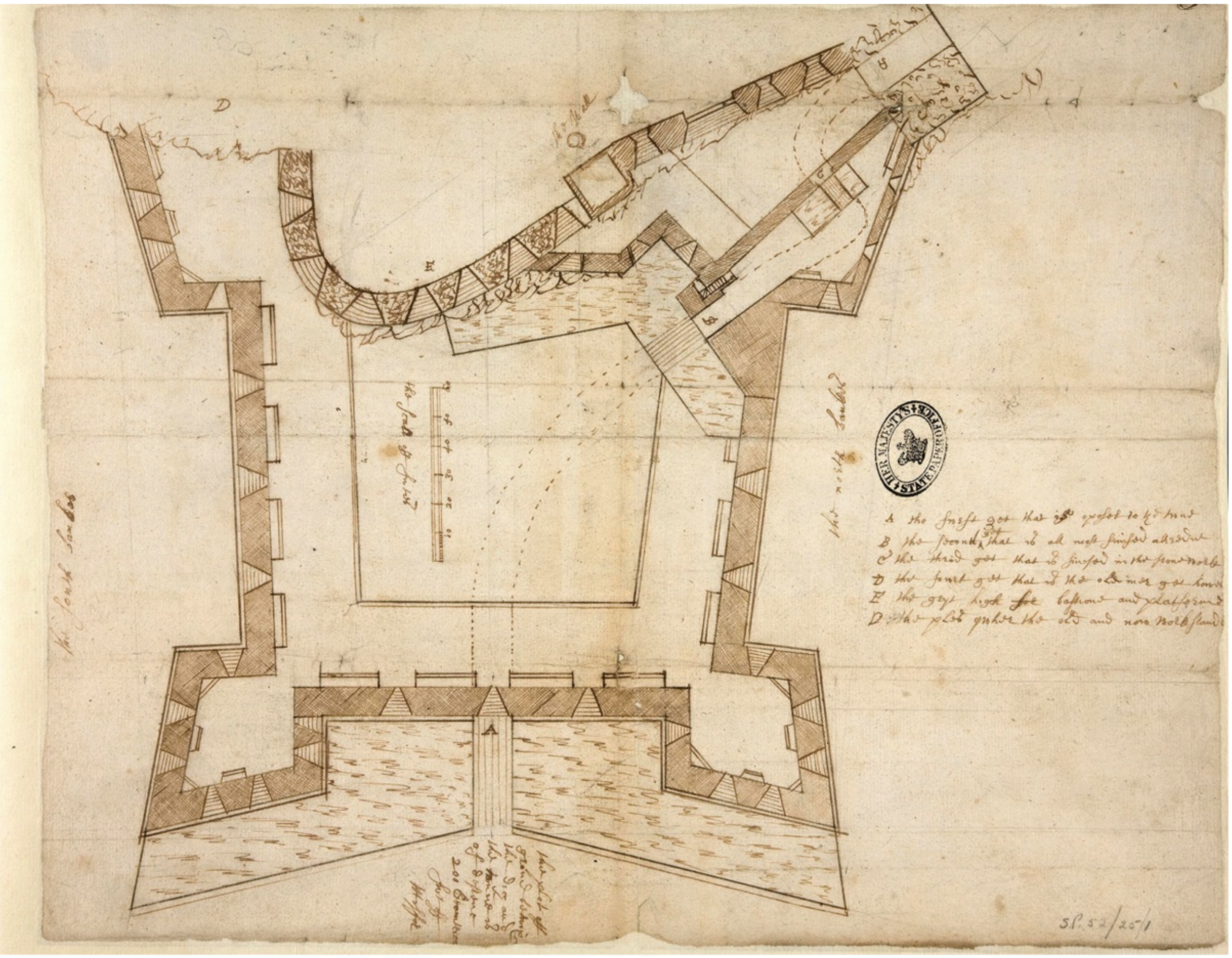
At the same time, civil wars, such as the German Peasants' Revolt, the Dutch Revolt and the French Wars of Religion, put a continuing premium on older fortifications, both castles and city walls. They could thwart or delay attacking forces, and thus have a major operational, even strategic, impact, which was the case in all three of these conflicts. For example in France, the fortifications of the Protestant-held town of La Rochelle successfully resisted a Royalist siege in 1572–73, although it fell in 1628 after a 14-month siege.

CULTURAL FACTORS

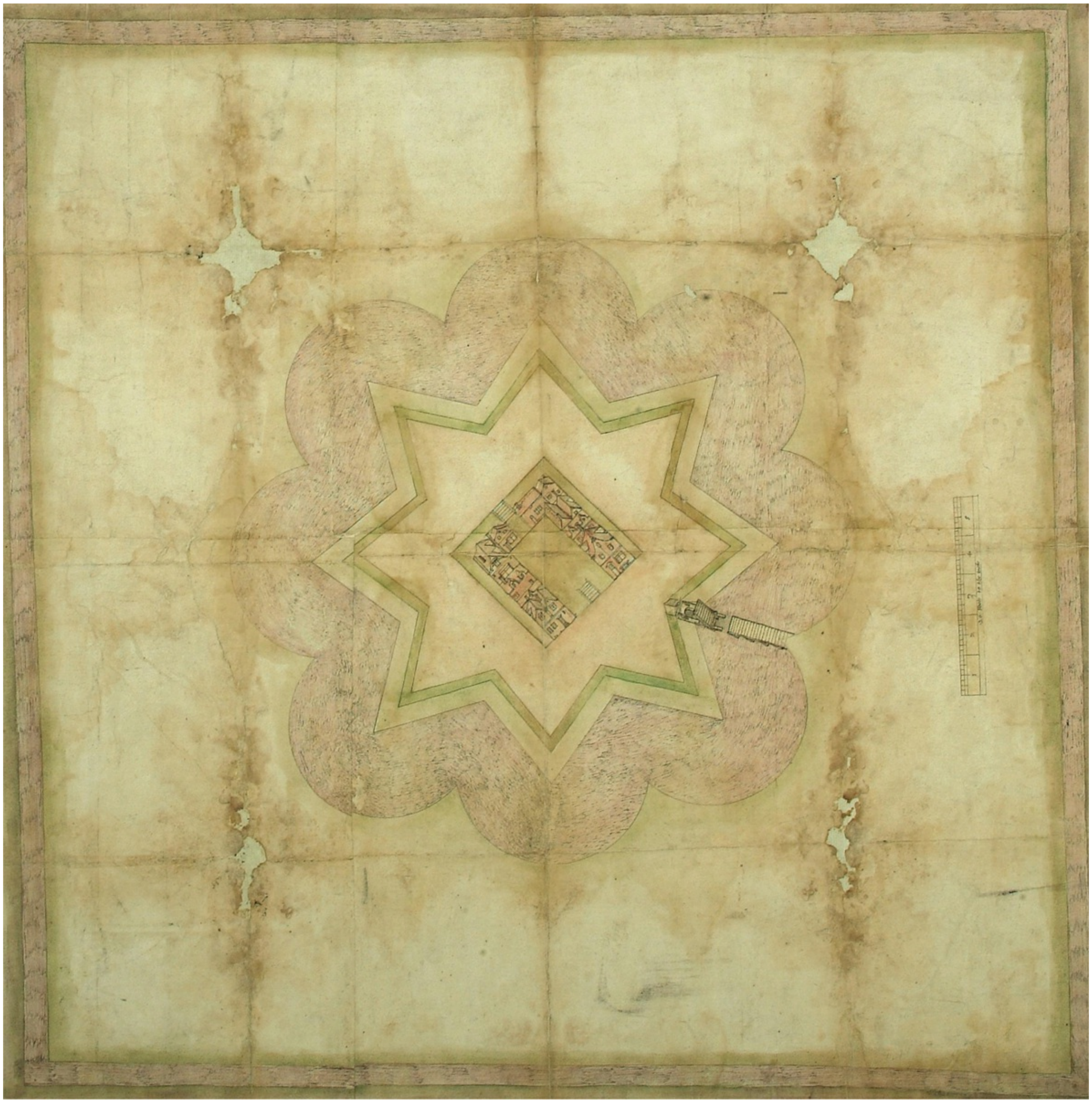
Cultural factors were important to fortification. This was clearly seen in South-East Asia where most cities, for example Aceh, Brunei, Johore and Malacca, were not walled in the medieval period. However, in response to European pressure, construction of city walls spread in the sixteenth century, for example in Java. Nevertheless, the notion of fighting for a city was not well-established culturally. Instead, the local culture of war was generally that of the abandonment of cities in the face of stronger attackers who then pillaged them before leaving. As in parts of Africa, captives, not territory, were the usual objective of operations. European interest in annexation and the consolidation of position by fortification reflected a different culture. Thus, the role of fortifications in part depended on cultural factors, a point that is more generally true of conflict. This was the case not only with the prudential value of these fortifications, but also with their symbolic significance.



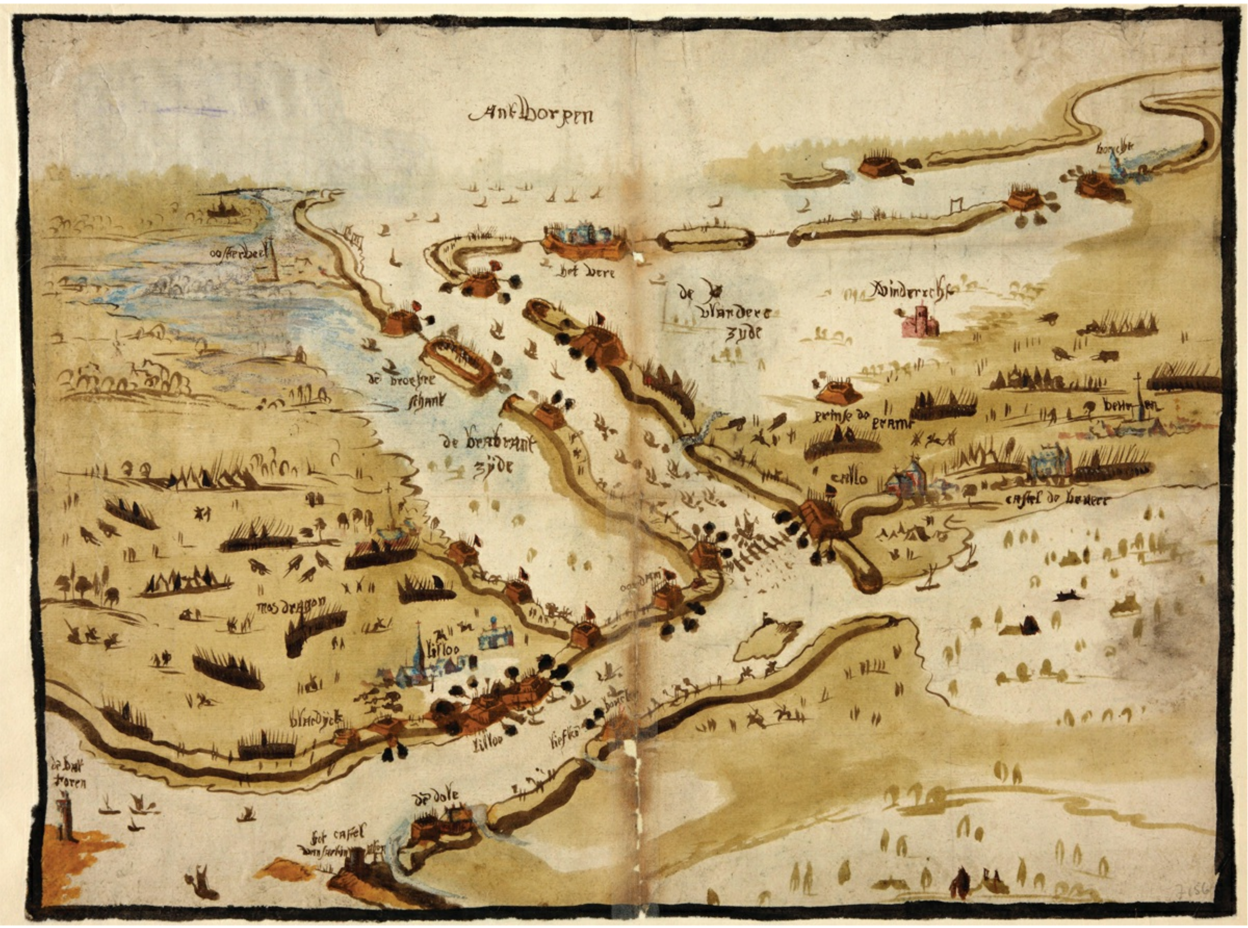
SIEGECRAFT Intellectually, European commentators on war were greatly influenced by Classical literature, but also had to cope with new technology. Western warfare could in part be understood in Classical terms: the Greeks, Macedonians and Romans did not have gunpowder weapons, but their forces did have a mixture of infantry and cavalry, cold steel and projectiles. For long, firearms were treated as similar to missile weaponry. However, the capacity offered by artillery eventually overtook that provided by traditional siege engines. In the first German translation of Vitruvius' first-century BC *De Architectura*, published in Nuremberg in 1548, the artist Peter Flötner and commentator Walter Hermann Ryff responded to the developing situation.


A the first gett that is opposet to the towne
B the seconde gett that is all most finished alredie
C the third gett that is finished in the stone worke
D the fourth gett that is the old iner gett howse
E the great high fore bastione and platforme
D the place where the old and new worke standes
the north flanke
the south flanke
the scale of feet
SP 52/25/1

FORTIFICATIONS AT EDINBURGH CASTLE, SCOTLAND, 1573 Scale 1 inch to about 25 feet. Built on a volcanic plug, where there was settlement from the late Bronze Age and probably an Iron Age hill fort, the castle became significant from the twelfth century. The total defeat of James IV of Scotland by the English at Flodden in 1513 led to plans for new artillery defences for Edinburgh, plans pushed forward in the 1540s, a period of renewed conflict with England, when an earthen angle-bastion was constructed. The castle was besieged by the English in 1560 as part of the defeat of the French attempt to suppress the Protestant Lords of Congregation who had rebelled against Mary, Queen of Scots, then also, as wife of Francis II, Queen of France. The English fleet played a key role by blockading Edinburgh's port, Leith. From 1571 until 1573, supporters of Mary held the castle against the Regent, the Earl of Lennox. The garrison in the castle bombarded the town in 1573, leading the English to send a force to attack the castle. Serious damage to the walls from English cannon led to the surrender of the castle, much of which was then rebuilt.



PLAN OF A FORTIFICATION ON THE ISLE OF SHEPPEY, ENGLAND, *c*.1574 This fortification has eight points surrounded by a moat, with the drawbridge shown raised. Plan may be by an engineer named Robert Lythe, who reported on the defensive situation of Sheppey to the Privy Council in 1574. Endorsed in hand of William Cecil, the Secretary of State, for defence of 'the shipps', a reference to the need to protect the River Swale where it joins the River Medway and, beyond that, the Thames. A fortress, called Sheppey or Queenborough Castle, was built to protect the anchorage in 1361–77, and was part of the broader defensive system designed from the 1530s to repel French or Spanish invasion attempts. Cecil had a longstanding interest in maps and commitment to new mapping.


Antworpen
borcht
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Winderecht
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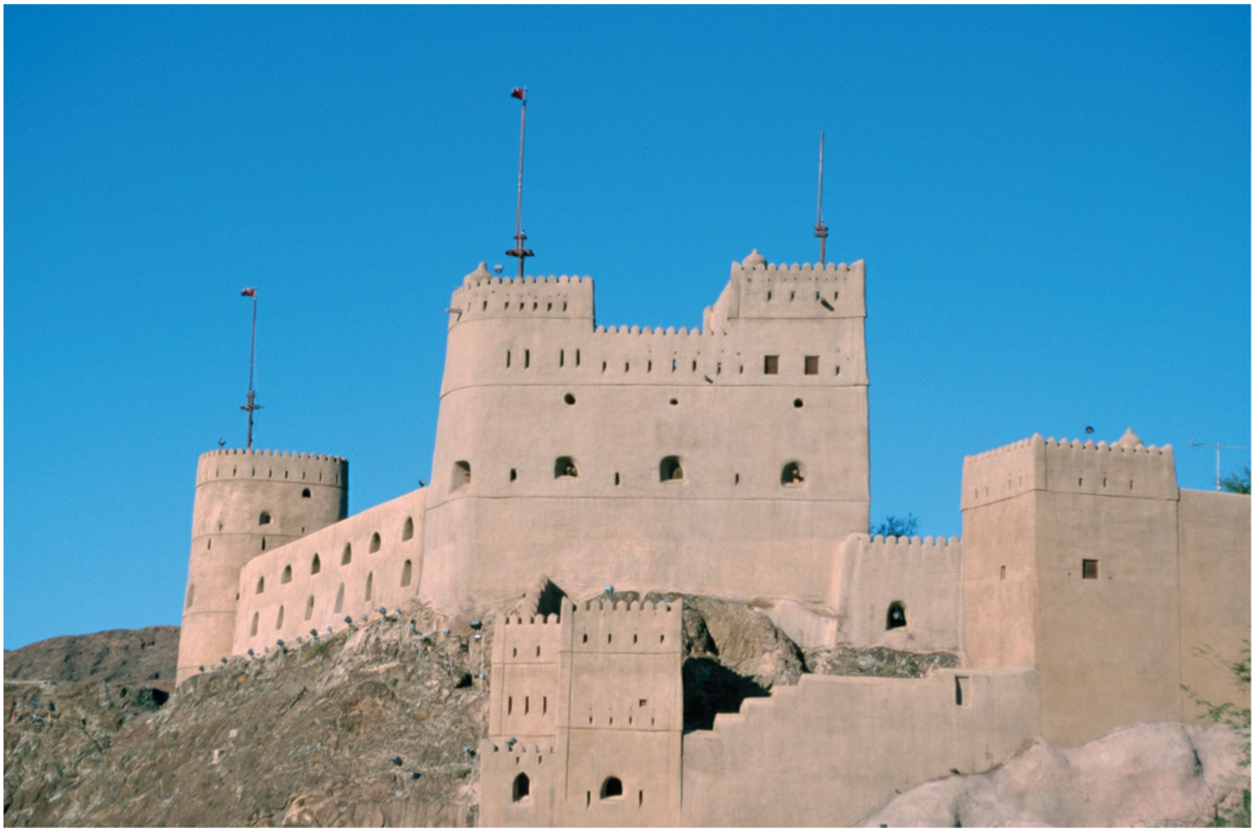
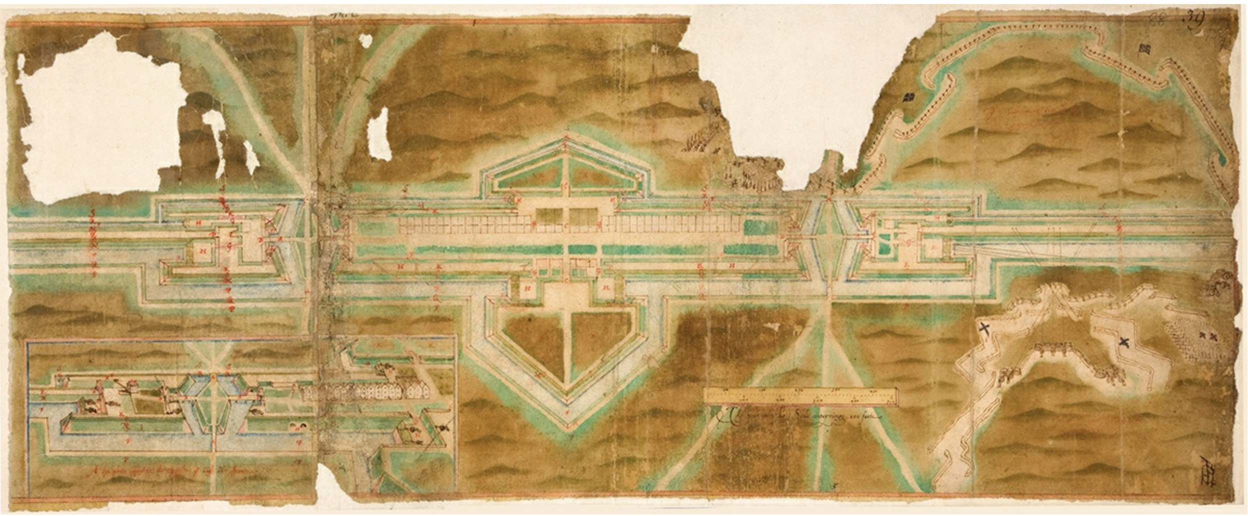
castel de beveer
mos dragon
Lilloo
blvedyck
lilloo
liefken
de dole
het castel
de bat toren

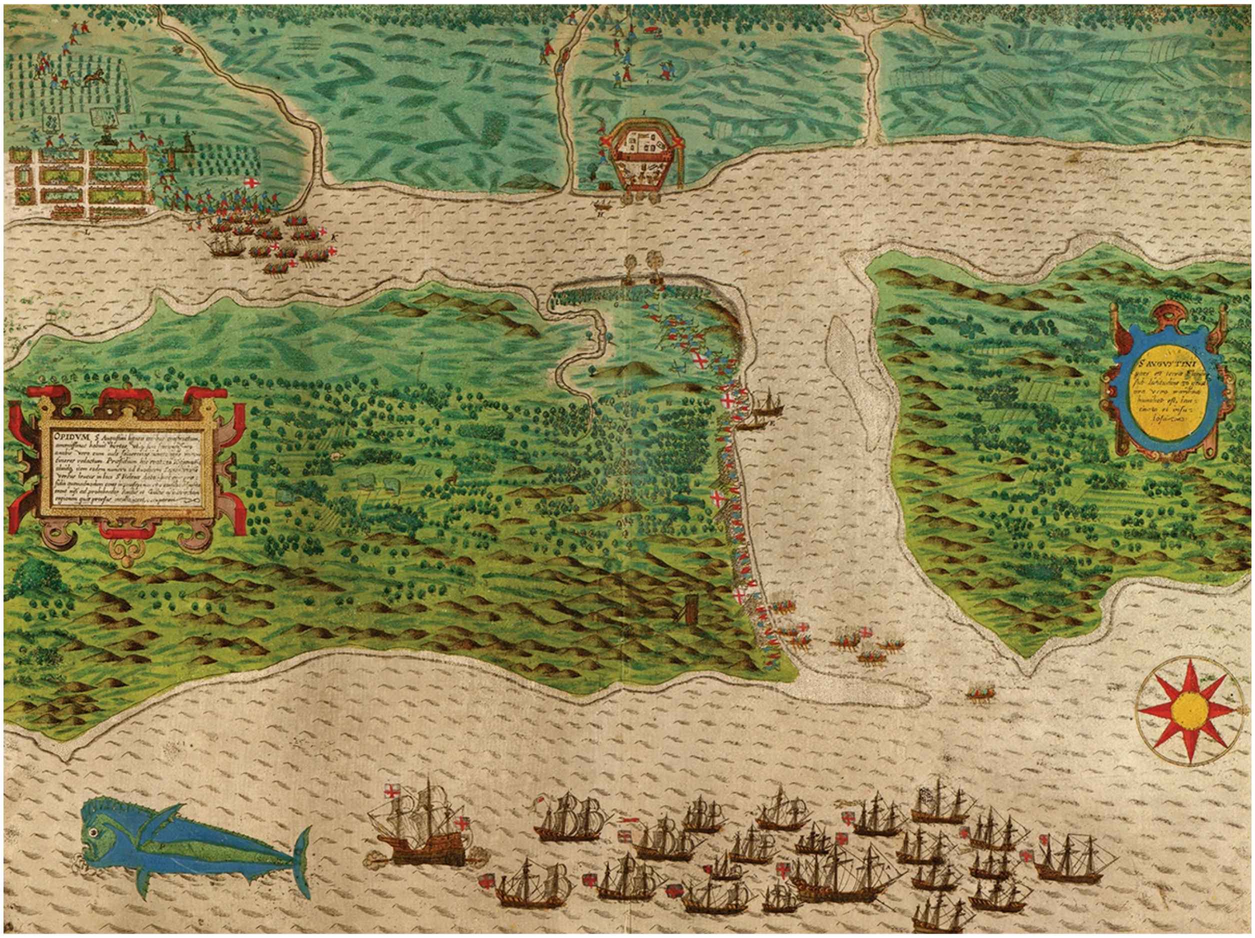
THE SIEGE OPERATIONS OF THE SPANISH ARMY OF FLANDERS, UNDER THE COMMAND OF ALESSANDRO FARNESE, DUKE OF PARMA, ON THE RIVER SCHELDT NEAR ANTWERP, 1585 This enclosure to a letter of 21 March 1585 from George Gilpin, Secretary of the Merchant Adventurers at Middelburg, to Sir Francis Walsingham, Secretary of State to Elizabeth I, shows the river and its banks, flooded in many places, as well as a fortified bridge, fortifications and encampments, with 'Antworpen' in the background. The first stage of the siege saw the construction, from July 1584, of entrenchments around the city, with forts built around the Scheldt estuary. Parma then constructed a pontoon bridge across the river that was fortified by a fort at each end. In response, the Dutch flooded the nearby land and attacked the Spanish positions with boats, including fireships. Their failure led to Antwerp's surrender on 17 August 1585.



MUSCAT, OMAN Al Jalali Fort in Muscat was built in 1586–88 to protect the harbour of Portuguese-ruled Muscat from Ottoman (Turkish) attack; the Ottomans had captured Muscat in 1552 and 1582. Named *Forte de São João*, the fort was built on top of a rocky prominence and included a gun deck designed to dominate the harbour. In 1650, Sultan bin Saif of Oman captured Muscat. The fort, now named al-Jalali, played a role in the civil war and Persian intervention of the early eighteenth century. After Ahmad bin Said al-Busaidi, the first ruler of the Al Said dynasty, captured the fort in 1749, he renovated it, adding the large central buildings and the round towers. Disputes among the ruling family ensured that the fort played a significant role in 1781–82. It subsequently became Oman's major prison.

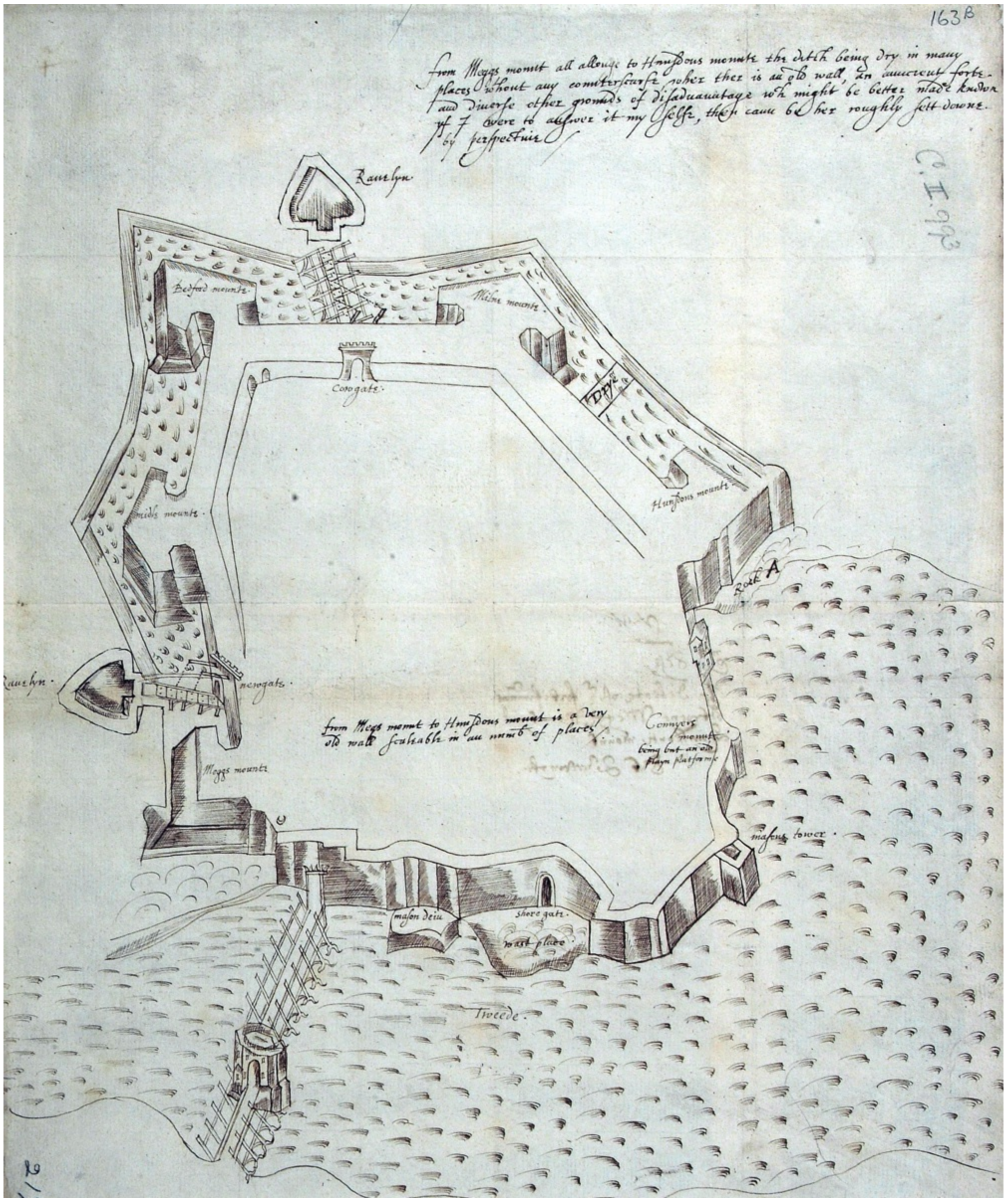


PLAN AND BIRD'S-EYE VIEW OF AN 'INSKONCE' (SMALL FORT) FOR THE DEFENCE OF THE ENGLISH BORDER WITH SCOTLAND, 1587 Scale about 1 inch to 120 feet. Drawn to accompany an anonymous treatise on fortifying the border. The imprisoned Mary, Queen of Scots was executed in England that year. England was not invaded anew from Scotland until the Second Bishop's War of 1640, and then again in 1644, in each case successful invasions, unlike those in 1848, 1715 and 1745.



ST AUGUSTINE MAP, FLORIDA, 1589 The major Spanish position in Florida was attacked and captured by Sir Francis Drake in 1586, a success recorded in this hand-coloured engraving by Baptista Boazio, produced in 1589. Defending a number of forts with about 100 soldiers, the Spaniards were heavily outnumbered by the English who had about 1,000 troops. Initially, the English attacked a small wooden fort in the sand dunes from which the Spaniards rapidly fled. The English then advanced on a Spanish log stockade fort, from which the garrison had fled, and finally the main settlement from which the Spaniards were driven. The forts were destroyed and Drake returned to England.

THE CONQUEST OF GRONINGEN, THE NETHERLANDS, 1594, SHOWN ON A SILVER COIN The Dutch leader Maurice of Nassau made major gains from Spanish forces in the north-east of the Netherlands in 1592–94 in a war of sieges. Groningen fell in 1594 after a two-month siege in which 10,000 cannonballs had been fired.


163B
from Meggs mount all allonge to Hunsdons mounte the ditch being dry in many
places without any counterscarfe wher ther is an old wall, an auncient forte.
and diverse other grounds of disaduauntage wch might be better made knowen
yf I were to answer it my selfe, then caun be her roughly sett downe.
by perspectuie
C. I. 99
Rawlyn
Bedford mounte
Wilsn mounte
Cowgate
Drye
midls mounte
Hunsdons mounte
Rock A
Rawlyn
newgate
from Megs mount to Hunsdons mount is a very
old wall scalable in an numb of places
Connyers mounte
being but an old
playn platforme
Meggs mounte
masons tower
mason deiu
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Tweede

FORTIFICATIONS AT BERWICK-ON-TWEED, 1598 Bird's-eye view of the fortifications, showing named strong-points, bridge over the River Tweed and gates. Note on defects in the defences between Meg's Mount and Hunsdon's Mount. In response to the crisis created in the 1550s by Franco-Scottish co-operation, and in response to the French seizure of Calais in 1558, a rebuilding of Berwick's fortifications in the *alla moderna* Italian style was pressed forward in the 1560s. This rebuilding combined stone bastions and walls with substantial earthworks. The cause of much expenditure, the walls were not used under Elizabeth I (r. 1558–1603), in large part because relations with Scotland eased after the overthrow of Mary, Queen of Scots in 1567, although concerns continued. Thus, there was no crisis with Scotland at the same time as war with Spain in 1585–1604, a key advantage missing in earlier wars with France. It is possible today to walk on the walls.

THE SEVENTEENTH CENTURY

The trends seen in the previous century continued, in part thanks to the use of military engineers who helped ensure the standardisation and spread of Western patterns of fortification. For example, Guillaume Levasseur de Beauplan, a French military engineer, served in Poland in the 1630s and 1640s. Mathematics was a key knowledge in the design of Western fortifications, in large part because of the need to work out covering angles when considering the layout of bastions and the location of cannon. Thus, the English mathematician Jonas Moore (1617–79) became a surveyor and then advised on the fortification of English-held Tangier (part of the dowry of the Portuguese princess Catherine of Braganza when she married Charles II in 1662), before becoming Surveyor-General of the Ordnance. In 1673, Moore published *Modern Fortification, or Elements of Military Architecture* and in 1683 a translation of Tomaso Moretti's *Trattato dell' artiglieri*.

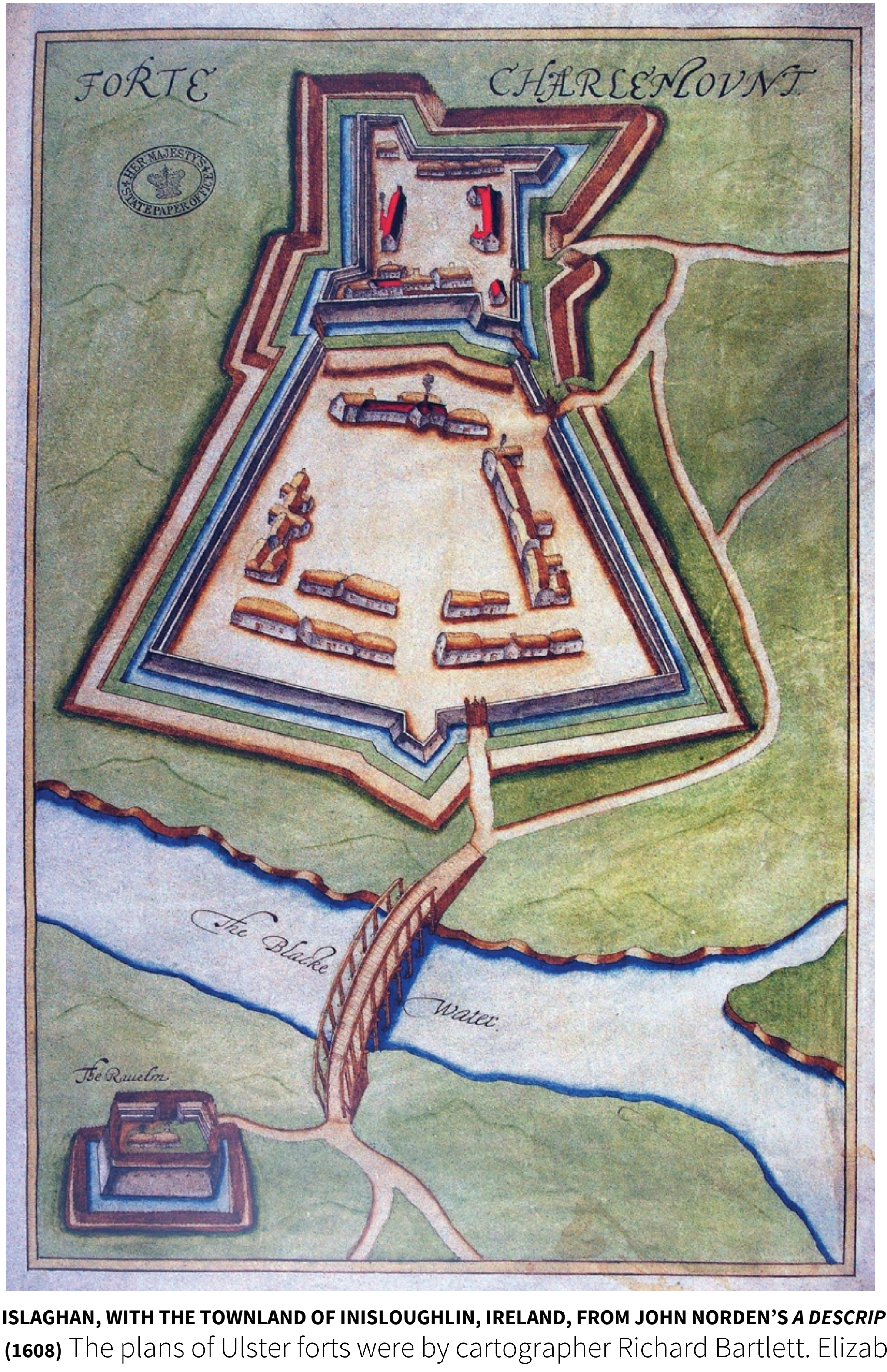
Fortifications were designed not only to deter other states but also to contain domestic disaffection. Thus, Louis XIV of France built the citadel of St Nicolas at Marseille in 1660, while, after the rebellion of the city of Messina in Sicily was suppressed in 1678, Carlos II of Spain imposed a substantial garrison in a new citadel. In turn, the fortified positions of aristocrats and towns that resisted government were weakened or destroyed. The transition from city walls, protected by an urban militia, to cities dominated by citadels, which were garrisoned by the forces of central government, was a common one during the century, as in Prussia under Frederick William, the Great Elector (r. 1640–88). This transition was also an aspect of the move from earlier medieval walls to Baroque-era fortifications, which was seen, for example, in Munich.

Although settled by battles, fortifications and sieges played an important role in the Thirty Years War of 1618–48 that engulfed most of the European powers, and in the British civil wars of the 1640s and 1650s. There were clear variations by combatant and campaigning area. In the Low Countries, sieges were more important than they were in Germany or for the Swedes. Thus, the Dutch focused on sieges of Spanish-held positions, such as those of 's-Hertogenbosch in 1629, Maastricht and Venlo in 1632, Breda in 1637, and Hulst in 1645, all of which were successful. It was scarcely surprising that these years also saw the development of a distinctive Dutch style of fortifications, which owed much to Simon Stevin and Adam Freitag. Stevin, a mathematician, founded an engineering school in the University of Leiden, and published a book on the construction of fortifications in 1594.

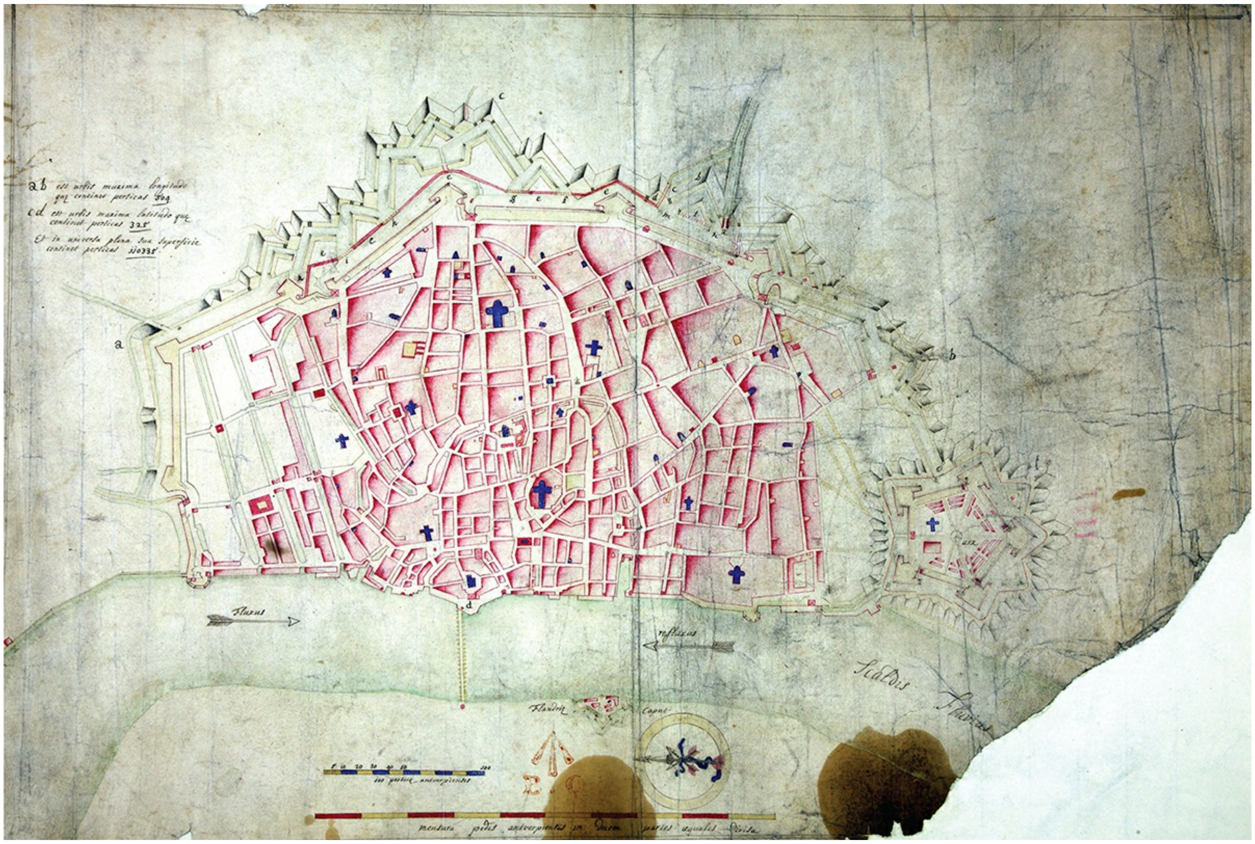
FIELD FORTIFICATIONS

In addition to fortresses, field fortifications could be highly significant. From the beginning, such fortifications were often a central part of the waging of war by the Swedes under Gustavus Adolphus (Gustav II Adolf, *r.* 1611–32). The Swedish soldiers were digging when not marching, and this was crucial to the survival of the Swedish army. In turn, in 1632, the Swedes were thwarted when their Austrian opponents under Wallenstein established a heavily fortified position at the Alte Veste where the Swedes could not make effective use of their cavalry. With the impetus of success gone, and the accompanying logistical benefits of the advance lost, the Swedish army suffered seriously from desertion, which owed much to the supply problems posed by the devastated countryside. Field fortifications played a role in the battle of Lützen later that year: Wallenstein remained on the defensive, deepening a ditch to the front of his position, although he was defeated.

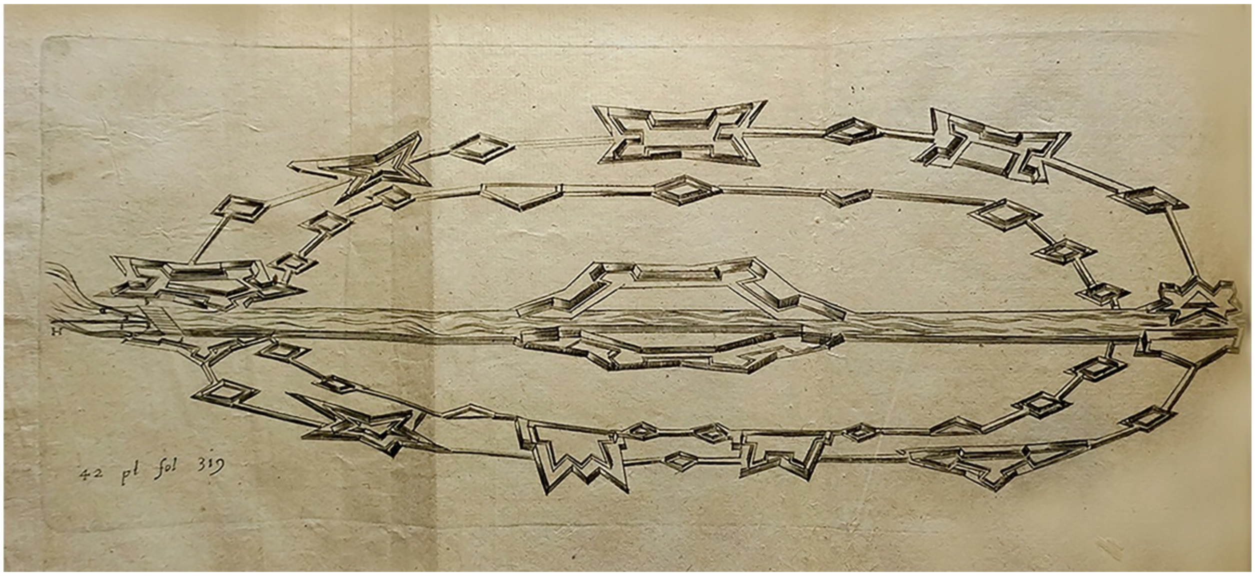
Such ditches were important features in many battles as they limited or constrained advances by opposing forces. Thus, at the battle of the Paitan River in India in 1616, a ditch in front of the Mughal army broke the cavalry attack by the forces of Malik Ambar of Ahmadnagar.


FORTE CHARLEMOUNT
HER MAJESTY'S STATE PAPER OFFICE
The Blacke water.
The Rauelin

FORT ENISLAGHAN, WITH THE TOWNLAND OF INISLOUGHLIN, IRELAND, FROM JOHN NORDEN'S *A DESCRIPTION OF IRELAND* (1608) The plans of Ulster forts were by cartographer Richard Bartlett. Elizabeth I's forces captured the Gaelic fort of Enislaghan in August 1602 during the Nine Years War (1594–1603) in Ulster. Located in a heavily wooded district, this fort was an important base for Gaelic operations against the Crown forces. Fynes Moryson, an English traveller, described the fort as protected by 'two deep ditches, both compassed with strong palisades, a very high and thick rampart of earth, and timber, and well flanked with bulwarks'.


ab est urbis maxima longitudo quæ continet perticas 509
cd est urbis maxima latitudo quæ continet perticas 325
Et in universa plana sua superficie continet perticas 110335
a
b
c
d
Fluxus
refluxus
Scaldis Fluvius
Flandria
Caput
arx
100 perticæ antverpienses
mensura pedis antverpiensis in decem partes æquales divisa

PLAN OF THE CITY AND CITADEL OF ANTWERP, BELGIUM The fortifications of the sixteenth century were maintained in the seventeenth, during which Antwerp remained under Spanish rule. Dutch advances concentrated on more exposed positions further east, notably Breda, which was captured in 1637. A Dutch advance on Antwerp in 1638 was defeated in battle in open country.



FORT PLAN BY ANTOINE DE VILLE Vauban's ideas and work built on the experience and publications of earlier experts, for example Antoine de Ville, who became military engineer to Louis XIII (r. 1610–43) in 1627. The book *Les fortifications du chevalier Antoine de Ville, contenans la maniere de fortifier toute sorte de places tant regulierement, qu'irregulierement* (Lyon, 1629) was reprinted in 1636, 1640, 1666, 1672 and 1625, and used by Vauban, which provides an instructive instance of the interrelationship of developments in the two halves of the seventeenth century. De Ville (1596–1656) served in the sieges of Huguenot-held Montauban and La Rochelle in the 1620s, before serving in the forces of Charles Emmanuel I of Savoy and then Venice. His book included discussion of recent examples alongside those from the Classical World.

CIVIL WARS

In the British civil wars of the 1640s, battles were crucial, but sieges proved highly significant. For example, in 1643, the storming of Parliamentary-held Bristol was important to the Royalist advance, but, conversely, Royalist sieges of Gloucester, Hull and Plymouth that year all failed, the first ending when a relief army arrived. Towns like Parliamentarian Northampton and Royalist Worcester supplemented surviving medieval walls with new fortifications. Castle walls were similarly improved, as in Northamptonshire at Rockingham Castle. In Worcestershire, Dudley and Hartlebury castles were major Royalist sites. Castles provided good bases for garrisons, and many were brought back into habitation and use. From Northampton, the Parliamentarians competed for control of the south-west of the county with Royalists from Banbury Castle, which had been refortified and established as a garrison to protect the

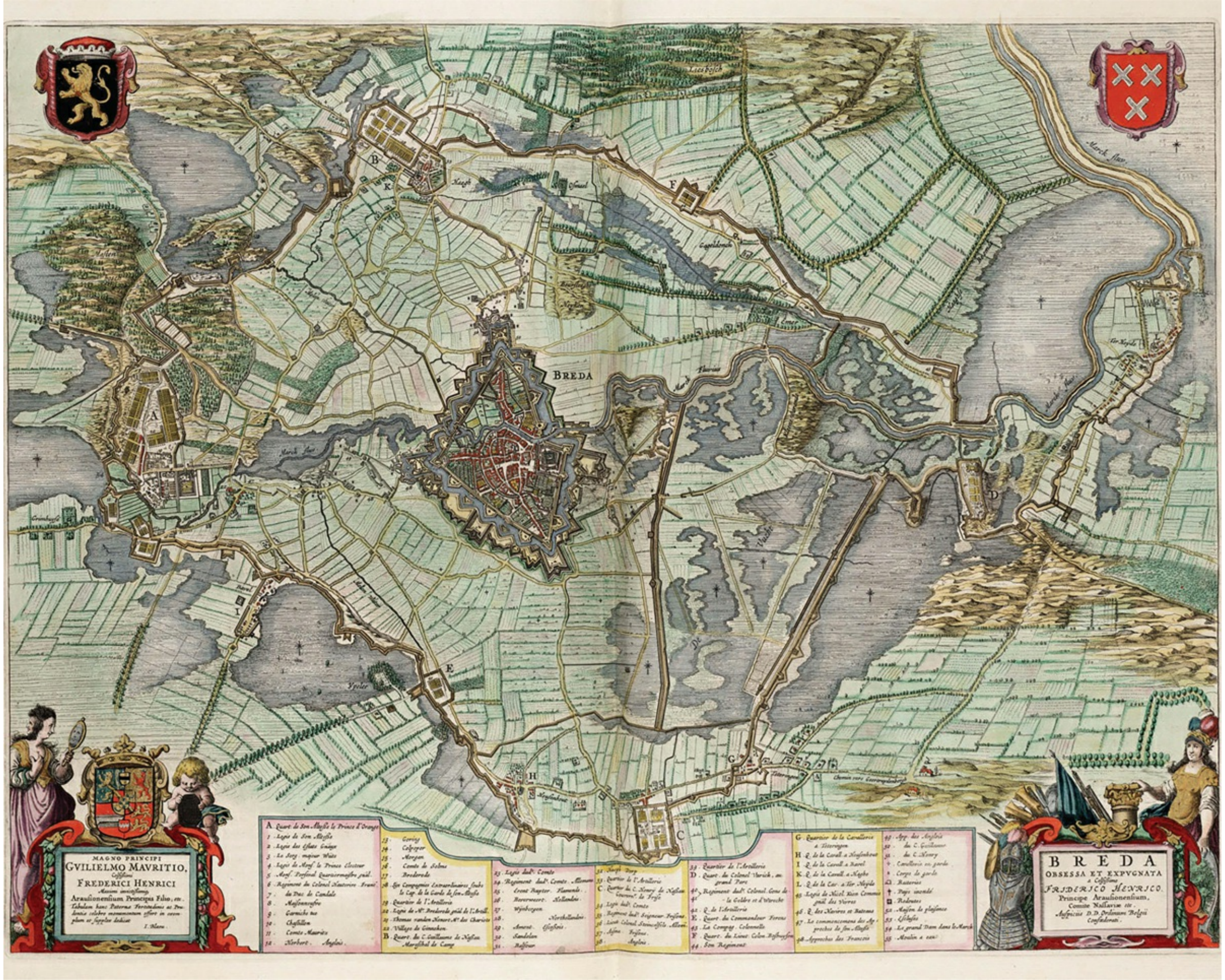
Royalist capital, Oxford, and its Royalist counterparts in the stately homes of Ashby de la Zouch and Belvoir Castle brought much devastation to Leicestershire.

Defences that were not tested could also be important, as with those of London that were hastily improved in 1642–43 in response to the threat of a Royalist attack that did not in practice come. An 11-mile-long earthen bank and ditch with a series of forts and batteries were built. However, holding castles proved fruitless in the event of defeat in the field. Thus, in 1645–47, Royalist castles in Wales fell to the remorseless pressure of superior Parliamentary forces: Beaumaris, Caernarfon, Chepstow and Monmouth in 1645, Aberystwyth, Conwy and Raglan in 1646, Harlech and Holt in 1647.

During and after the wars, the victorious Parliamentarians 'slighted' fortresses. For example, at Kenilworth, the north side of the keep was demolished and parts of the outer curtain wall were destroyed. Corfe, Dunster and Winchester castles were also among the many slighted. In turn, after the Stuart restoration in 1660, the walls and defences of major towns that had backed Parliament, such as Gloucester and Northampton, were slighted.

STRUGGLES BETWEEN STATES

In general, however, it was struggles between states that tended to be the key element in the use of fortifications. This was seen with Mughal expansion in India, where the Deccan sultanates of Bijapur and Golconda were annexed in 1685–87 following successful sieges. These were massive enterprises in which strongly walled positions with substantial garrisons fell to large armies, the supply of which was a formidable undertaking. Aurangzeb, the Mughal Emperor, besieged Golconda with its four-mile-long outer wall in 1687. Two mines were driven under the walls, but they exploded prematurely. The fortress finally fell to betrayal; Mughal forces entered through an opened gateway.


BREDA
MAGNO PRINCIPI
GVILIELMO MAVRITIO,
FREDERICI HENRICI
Arausionensium Principis Filio, etc.
I. Blaeu.
BREDA
OBSESSA ET EXPVGNATA
FRIDERICO HENRICO.
Principe Arausionensium,
Comite Nassaviae etc.
A
B
C
D
E
F
G
H

BREDA, THE NETHERLANDS Captured by the Spanish Army of Flanders in 1625, Breda was recaptured by the Dutch in 1637. These operations were the major events in individual campaigns and possibly entailed a swallowing of strategy by operational factors and the latter sometimes by tactical issues. On the other hand, positions like Breda were clear targets that could register success. In 1637, the Dutch initially benefited from the Spanish focus on operations against France.

Kandahar, the gateway for the Persians to any advance into southern Afghanistan and the Indus Valley, was the fortress that played the key role in conflict with the Mughals, whose attempts to regain it in 1649, 1652 and 1653 failed. It was difficult to campaign effectively so far from the centre of Mughal power in northern India, and success had to be obtained before the harsh winter set in. Mughal siege cannon was of poorer quality and less accurate than the Persian cannon, which inflicted heavy casualties on the besiegers. In 1653, three specially cast Mughal heavy guns made breaches in the walls of Kandahar, but the onset of winter and logistical problems made it impossible to exploit them.

The availability of relief armies or fleets was also a key factor in sieges, as with the Spanish relief of Alessandria in northern Italy in 1657 when it was besieged by the French, the Manchu success in holding off the siege of Nanjing by Ming loyalists in 1659, and that of the Austrians in surviving the Turkish siege of Vienna in 1683. The walls of Vienna had been breached, but the defenders were still holding out when the city was relieved by a German-Polish army under John III Sobieski, King of Poland. Conversely, the failure of relief forces could also be crucial, as, in England, with the fall of Royalist-held York in 1644 after the Parliamentary victory over a relief army at the battle of Marston Moor, and in India with the Mughal capture of Maratha fortresses.

French sieges in the Spanish Netherlands were ultimately dependent on battles, notably Condé's victory over the Spanish Army of Flanders at Rocroi in 1643 and successive French victories over William III of Orange at Seneffe (1674) and Mont Cassel (1677). The latter arose from a failed effort by William to relieve St Omer, while the battle of St Denis in 1678 was a result of his attempt to relieve Mons. The French siege of Rheinfelden in 1676, begun after a battle nearby, ended when Duke Charles V of Lorraine appeared at the head of an Austrian force.

Sieges depended on blockade, bombardment and storming. For example, at Philippsburg, the principal German fortress on the middle Rhine, French cannon prevailed in 1688 over those of their opponents and the outworks were taken by storm. This successful siege was a crucial accretion of prestige for the French commander, the Dauphin, the heir to Louis XIV, who was in command of the siege army.

FIT FOR PURPOSE

Fitness for purpose is a crucial concept when judging the applicability of fortifications. For example, those deemed necessary to withstand a major siege in Western Europe were generally more than were necessary for Eastern Europe, and far more than were required to defeat a rebellion. However, as external pressure from the Christian powers on the Turks increased from the late seventeenth century, the Ottomans built some impressive fortifications, many of which only fell after lengthy sieges. River crossings were key sites, but generally as part of a protection of the major centres of population. These fortresses included Belgrade, Buda and Vidin on the Danube, Temesvár on the Tisza, Khotin and Bender on the Dniester, Ochakov and Kinburn controlling the Dnieper estuary, and Azov on the Don. Although technically not as impressive as the fortifications that were built in Christian Europe, the Turkish positions, which reflected the resources available, fulfilled the same purpose: in general, they absorbed considerable effort before they fell.

The Austrians initially found it difficult to follow up their essentially defensive success in defeating the Turks at Vienna in 1683. The following year, their commander, Duke Charles V of Lorraine, besieged Buda, the key to Hungary, but the fortress was a strong one with powerful cannon. Disease and supply difficulties hampered the four-month siege, which was eventually abandoned. In 1686, however, when a new siege was mounted, a shell landed on the main powder magazine, blowing open a breach in the walls, and repeated assaults then led to the fall of the city. Later in the war, the Austrians captured Belgrade in 1717, only to lose it to a Turkish counter-offensive in 1739. In each case, victories in battle determined the fate of the fortress. In the eighteenth century, the Turks increasingly used Europeans to design fortifications.

Under Louis XIV (r. 1643–1715), France proved particularly assiduous in constructing and improving fortresses to protect its borders and, in doing so, to entrench Louis' conquests, a policy already advocated in Cardinal Richelieu's *Testament Politique*, compiled in the late 1630s. A key role under Louis XIV was played by Sébastien Le Prestre de Vauban, a master of siegecraft as of fortification.

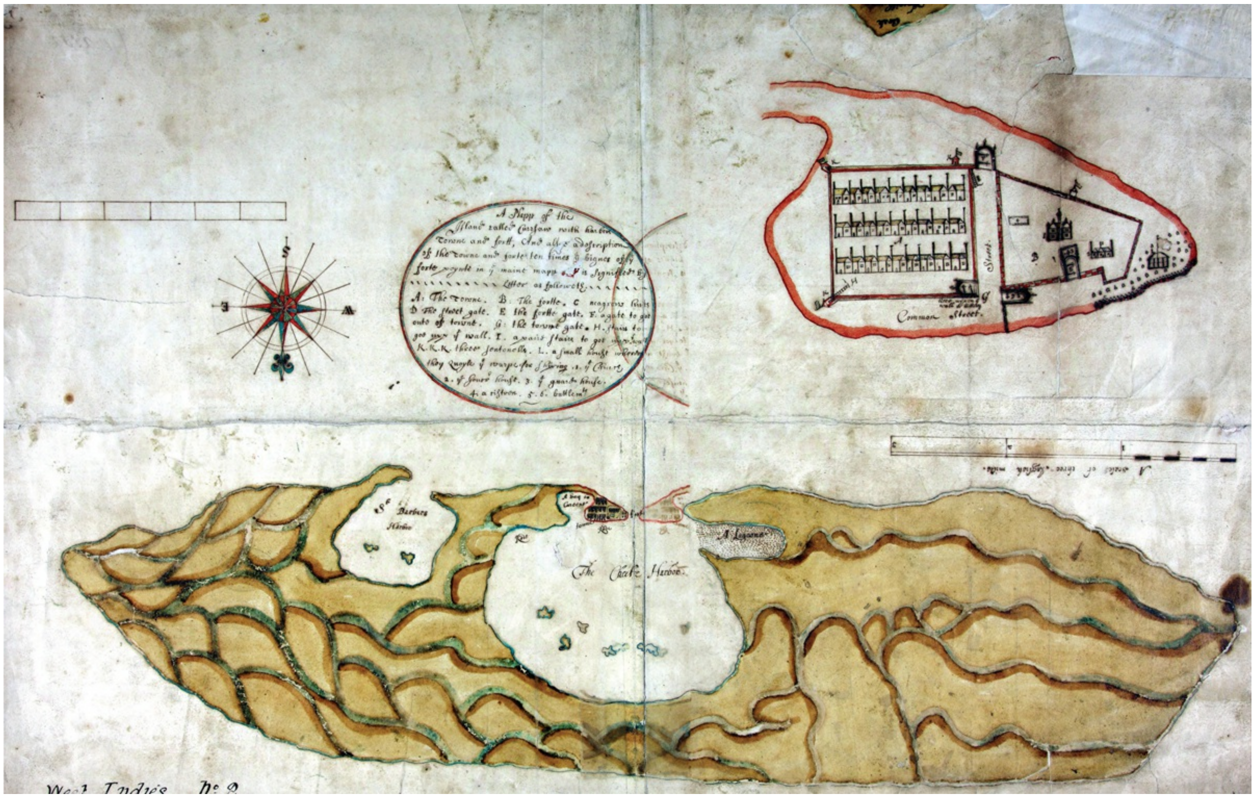
Under Louis XIII, there had been major fortifications, for example at Pinerolo on France's Alpine frontier, but nothing that compared with the systematic attempt to defend vulnerable frontier regions with new fortifications that his son, Louis XIV, supported. A double line of fortresses was created to defend France's vulnerable north-eastern frontier, the frontier across which Spanish attacks, in this case based in Belgium, had proved most threatening, notably in 1636. Appointed Commissioner General of Fortifications in 1678, Vauban supervised the construction of 33 new fortresses, such as those at Arras, Blaye, Ath, Lille, Mont-Dauphin, Mont-Louis and Neuf-Brisach, and the renovation of many more, such as Belfort, Besançon, Landau, Montmédy, Strasbourg and Tournai.

These fortresses proved of lasting worth. Captured from Spain by France in 1667, Lille was refortified by Vauban: 400 men worked on the citadel for three years, creating a base for 1,200 troops. The principal entrance, the Place Royale, was built at an angle to the drawbridge to avoid direct hits. Although it was to fall to the British in 1708, the still-impressive citadel did not do so in 1744 or 1792, to the British and Austrians respectively. In 1940, the firm, albeit ultimately unsuccessful, defence of Lille delayed the German advance toward the English Channel, providing more opportunity for the evacuation of forces from Dunkirk.

In essence, Vauban's skilful use of the bastion and of enfilading fire represented a continuation of already familiar techniques, particularly layering in depth, techniques that looked back to the age before gunpowder. Vauban placed the main burden of the defence on the artillery. It was the crucial ability of the French state to fund such a massive programme that was novel. Neuf-Brisach, built to control an important crossing of the River Rhine, offer a route into southern Germany and compensate for the loss of Breisach by France in the 1697 peace treaty, cost nearly three million livres to construct between 1698 and 1705. Vauban also played a role in the fortification of France's naval bases. This was an aspect of the major build-up of the French navy under Louis XIV, and a response to the threat of attacks on the bases. Indeed, both Brest and Toulon were unsuccessfully attacked during Louis' reign. Vauban's reputation led to the publication of his works well into the eighteenth century, even outside France. The fifth edition of his *New Method of Fortification* was published in London in 1748, while an edition of his collected works was published in Amsterdam and Leipzig in 1771.

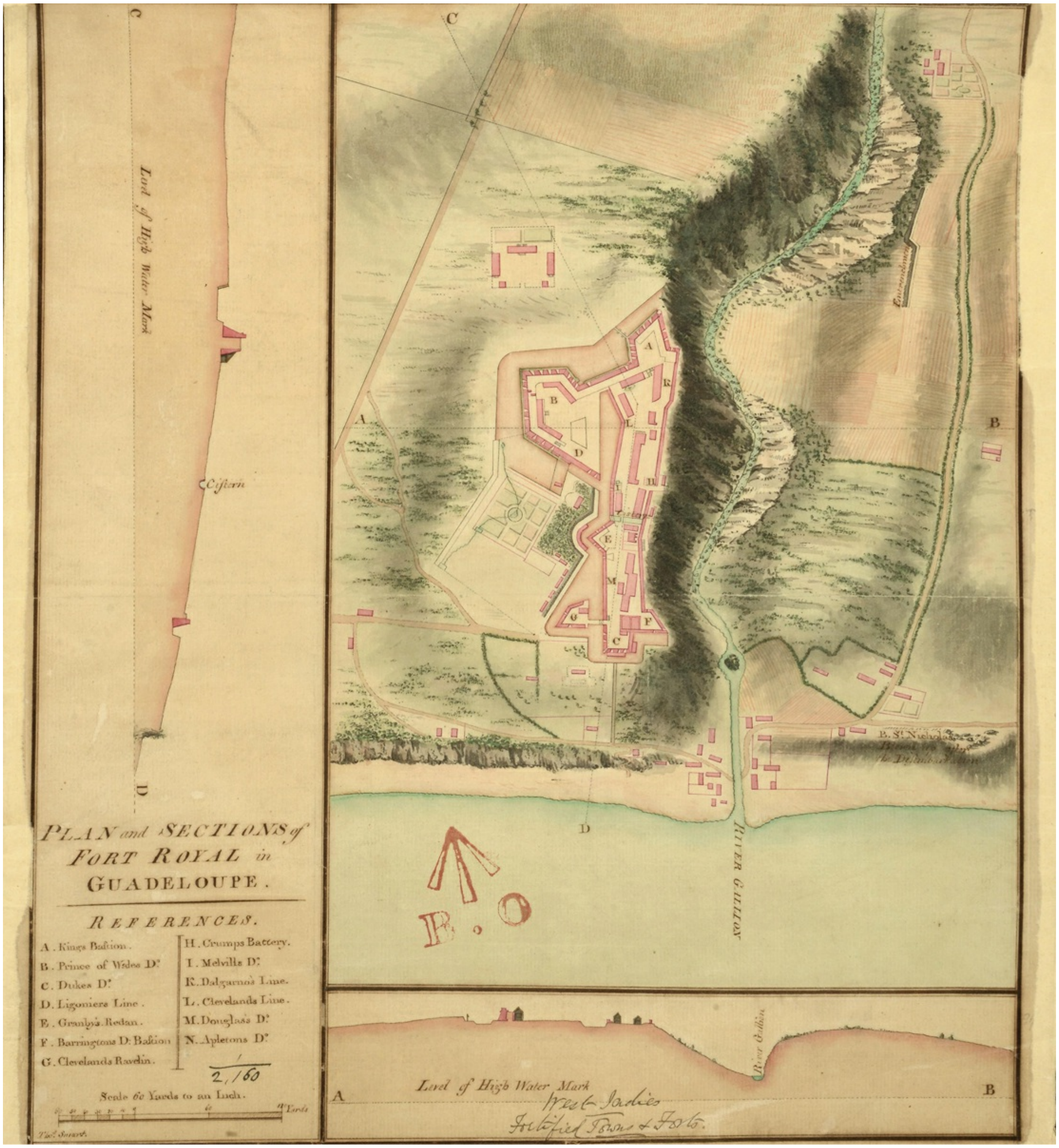
FURTHER EXPANSION

Fortresses were designed not only to defend frontiers, but also to facilitate new gains by safeguarding bases for operations, notably the crucial accumulation of stores. In 1689, Louis indicated that he wanted to retain possession of Casale, a fortress on the Italian side of the Alps he had gained in 1681, as it provided a base for operations in Spanish-held Lombardy. There was strategic point in the location of fortresses. For example, Novara, Alessandria, Tortona and Valenza were seen as links in a chain aimed at the defence of Lombardy from attack by Savoy-Piedmont from the west, and therefore also from France.

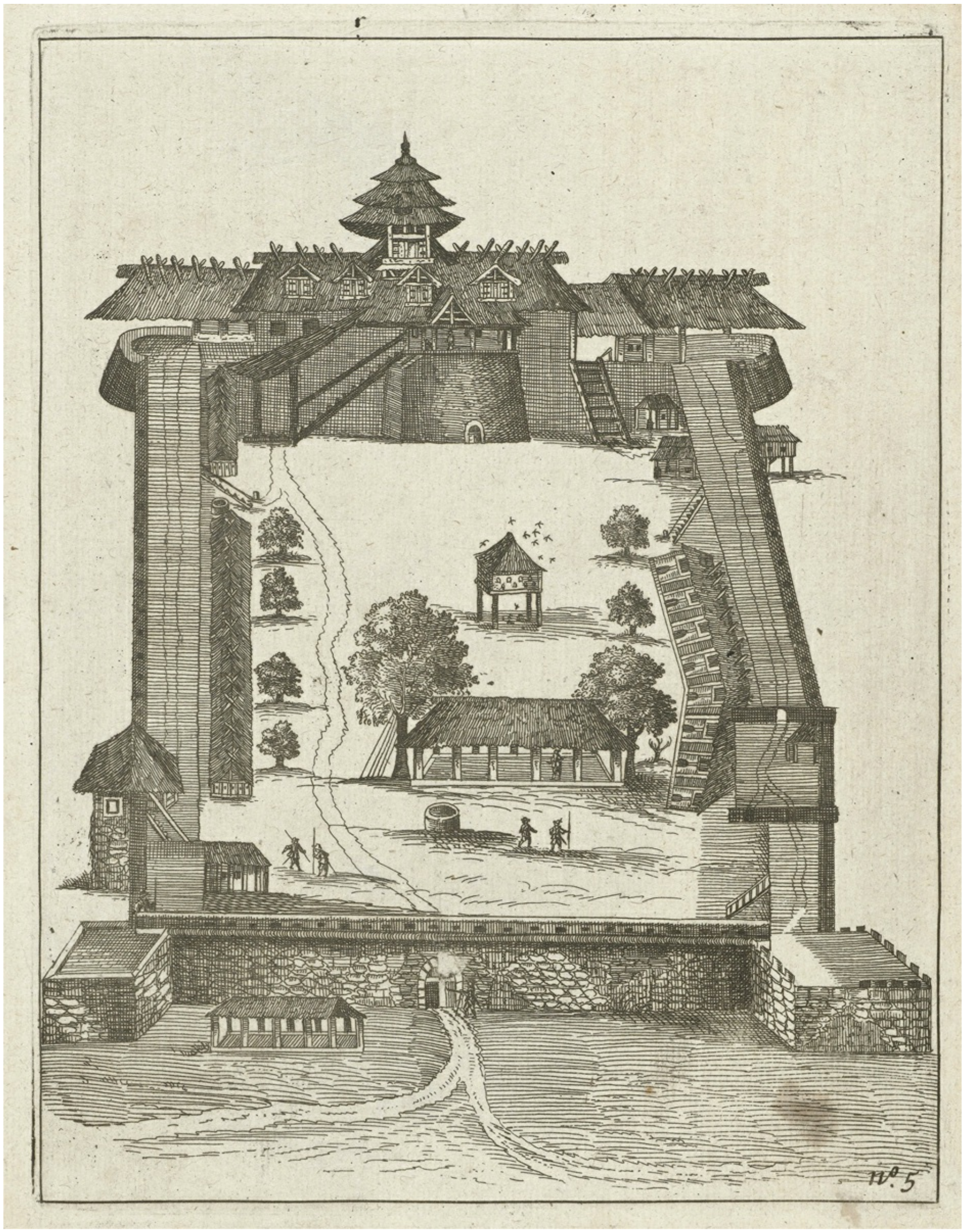


FORT AMSTERDAM, CURAÇAO Fort Amsterdam was built by the Dutch West India Company on the point of the eastern finger of land at the entrance to St Anna Bay, a natural harbour. In 1634, the Dutch, under Johannes van Walbeeck, who were involved in a bitter and intractable war with Spain (1621–48), captured the island from an outnumbered Spanish force, and then began the fort, in part using African slaves and local Arawaks for the work. A lack of drinking water and food caused problems, but the fort, with its four bastions and three metre thick walls, was completed in 1635. It became the headquarters of the Company administration and the town of Willemstad grew up outside it. In 1713, a French privateering force intimidated the governor into paying money to avoid being looted. Curaçao was a major Dutch entrepôt in the slave trade to Spanish-ruled Venezuela from the mid-eighteenth century. The fort fell to the British in 1800 and 1807, and to Venezuelan rebels in 1929.

Outside Europe, fortification remained crucial to European expansion, for example in the Americas and West Africa, but also more widely. Thus, in 1635, Zamboanga, on the coast of Mindanao in the southern Philippines, was founded as a city by Spain and a strong fortress was constructed under the direction of the Jesuit missionary-engineer Melchor de Vera. Attacked by the Dutch in 1646 and later by pirates, it was rebuilt in 1718–19, soon after surviving attack by Moro pirates.


PLAN and SECTIONS of FORT ROYAL in GUADELOUPE.
REFERENCES.
A. Kings Baſtion.
B. Prince of Wales D°.
C. Dukes D°.
D. Ligoniers Line.
E. Granby's Redan.
F. Barringtons D: Baſtion
G. Clevelands Ravelin.
H. Crumps Battery.
I. Melvills D°.
K. Dalgarno's Line.
L. Clevelands Line.
M. Douglass's D°.
N. Apletons D°.
1/2,160
Scale 60 Yards to an Inch.
Yards
Thos. Smart
Level of High Water Mark
Cistern
River Gallion
B. St. Nicholas
A
B
C
D
West Indies
Fortified Towns & Forts.
B. O

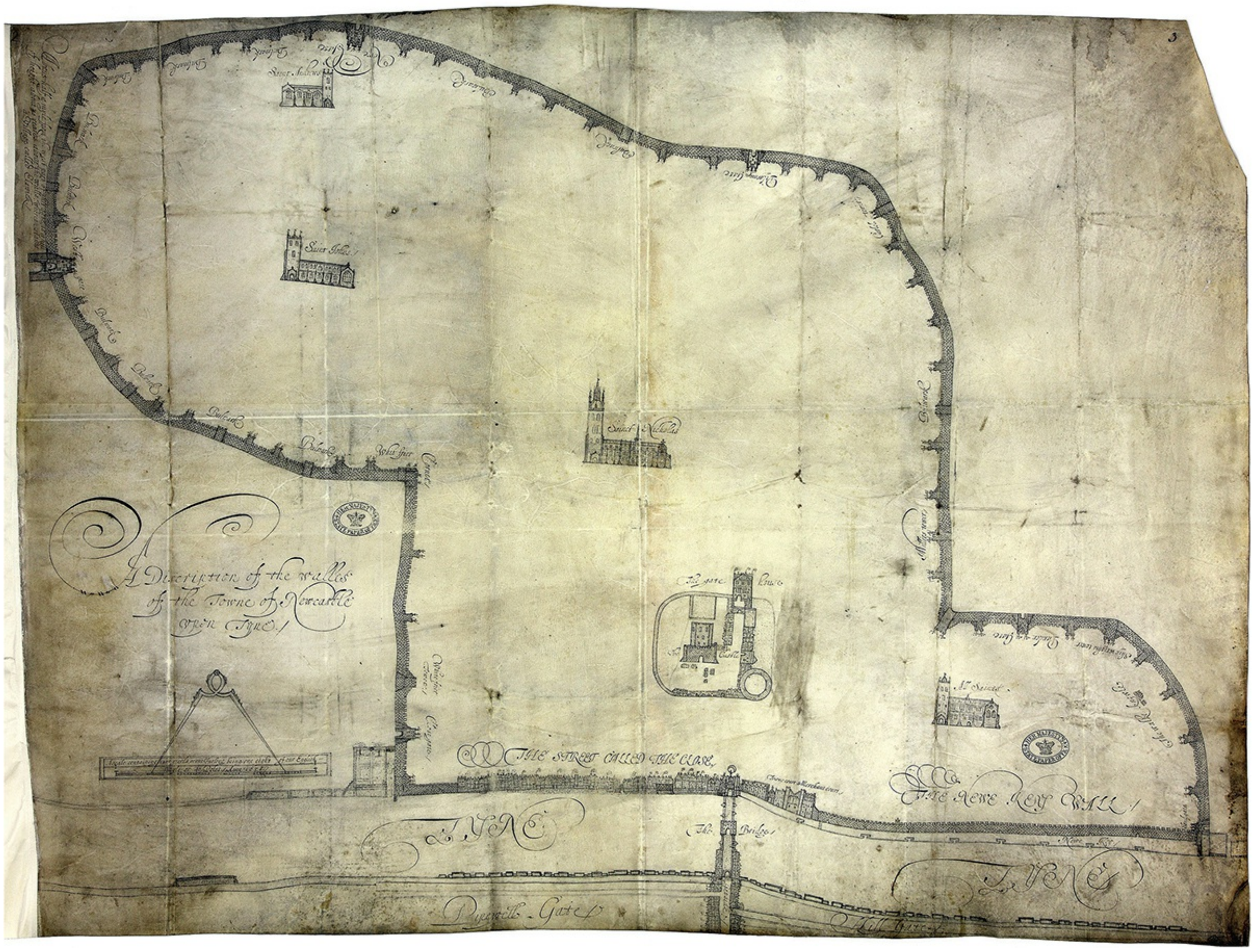
FORT ROYAL, GUADELOUPE The key French position on the plantation island was the target of British attack. A French colony from 1635, it held off an attack in 1691 thanks to the strength of the fortifications, the arrival of a French squadron and disease among the English, and again in 1703, thanks to poor British army-naval coordination, only to fall in 1759. Returned under the Peace of Paris of 1763, it was captured by the British (and lost again) in 1794 and recaptured in 1810. Returned to France in 1814, it was seized by the British again in 1815 and returned to France in 1816.



FORT AMSTERDAM, AMBON, INDONESIA Built in 1637 by the Dutch East India Company, who had driven out the Portuguese in 1609, this blockhouse was developed in order to help overcome a local uprising. This fort indicates the extent to which European colonial powers adapted to local building materials and conditions, including the need to provide protection against other European powers.

Fortresses were also crucial to the retention of control. Goa, the major Portuguese base in India, successfully resisted attack by the Sultanate of Bijapur in 1510, 1654 and 1659, and by the Marathas in 1683, while Batavia, the major Dutch base on Java, survived two sieges by Sultan Agung of Mataram in 1628–29.

In Siberia, Russia enforced its position with the construction of a series of fortresses. Forts were established at Yeniseysk on the River Yenisey in 1619, Yakutsk on the Lena in 1632, Okhotsk on the Sea of Okhotsk in 1649, and Irkutsk in 1661. The Pacific itself had first been reached in 1639 and a post then established at the mouth of the Ulya river. Forts maximised the defensive potential of firearms. Attacks on forts, such as that of the Tungus on Zashiversk in 1666–67, were thwarted by the use of defensive gunfire, although Okhotsk was stormed by the Tungus in 1654. It was speedily rebuilt by the Russians, and subsequently resisted local rebellions in 1665 and 1677; in the last, it was

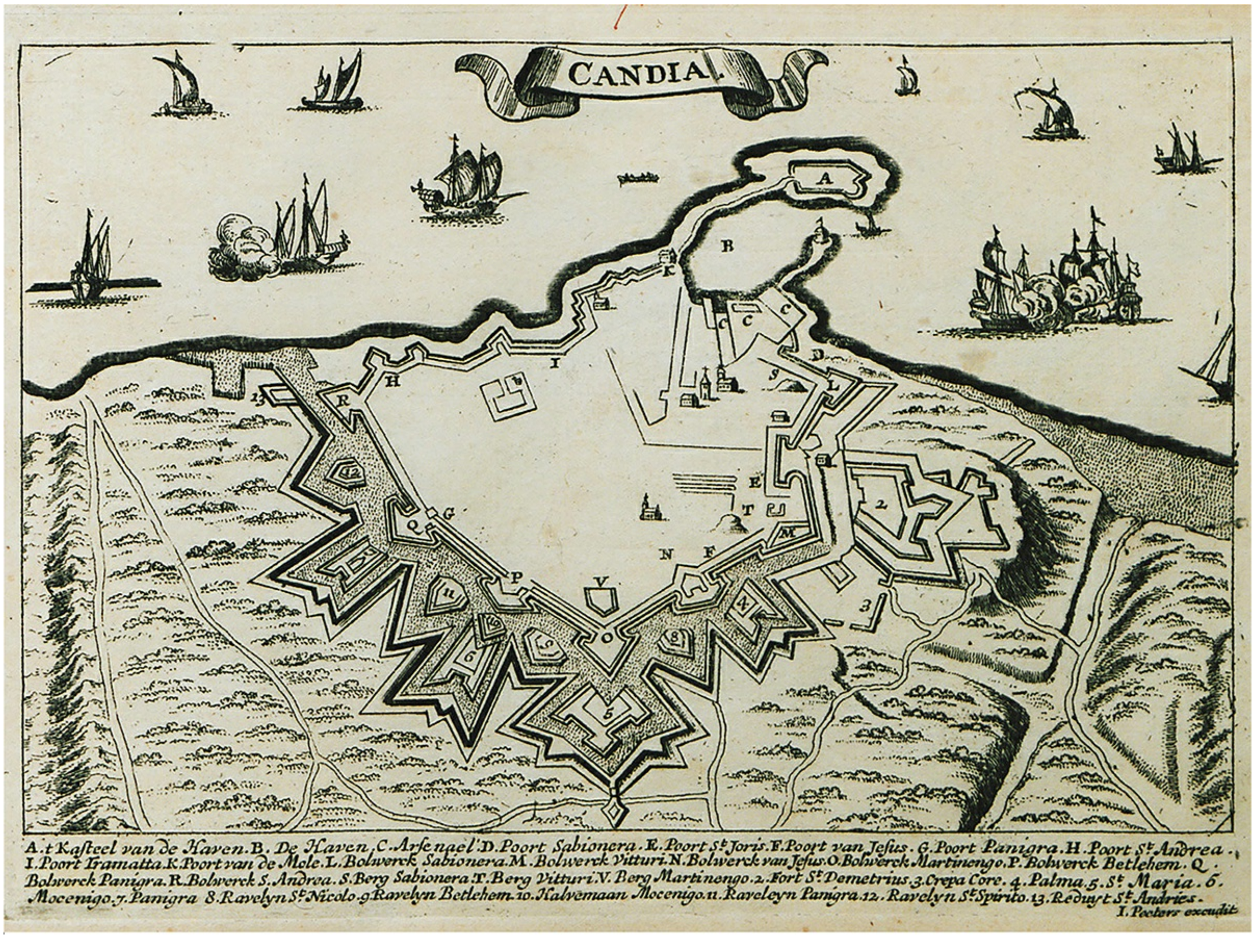

A Discription of the walles of the Towne of Newcastle upon Tyne./
Saint Andrews
Saint Johns
Saint Nicholas
The Castle
All Saints
THE STREET CALLED THE CLOSE
THE NEWE KEY WALL
The Bridge
TYNE
TYNE
Pypewell Gate
Hill Gate

WALLS OF NEWCASTLE-UPON-TYNE, ENGLAND, 1638 The plan shows the defences of the city and the River Tyne, including Tynemouth Castle. Hills that command the town are marked, as that helps establish vulnerability to cannon. The castle was built in 1080, the city wall around 1265. The castle was refortified in 1643 during the Civil War. besieged without success by

1,000 men armed with bows and bone-tipped arrows.

Less well-fortified or less strongly defended positions could fall, as did the Portuguese bases at Ormuz to the Persians in 1622, Muscat and Mombasa to the Omanis in 1650 and 1698 respectively and the Portuguese bases around the Bay of Bengal. At the same time, the fate of Portuguese positions usually reflected not so much their inherent strength or weakness, but rather the possibility of relief or recapture and the interaction of local rivalries with broader patterns of great-power antagonism. Moreover, if in the 1630s and 1640s the Portuguese lost positions to attack by the Dutch, they were also able to recapture some of them. In 1662, the Dutch bases of Fort Zeelandia and Keelung on Taiwan fell to attack by Zheng Chenggong (Coxinga), a Ming-loyalist Chinese pirate.

Attacks on fortresses frequently led to their improvement. In 1672–87, in response to an unsuccessful attack in 1668 by Robert Searles, an English pirate, the Spaniards constructed at St Augustine in Florida the Castillo de San Marcos, a massive stone fortress with a permanent garrison. During the century, England mounted both a successful (1627) as well as an unsuccessful (1690) attack on Québec, each of which encouraged the French to improve its fortifications.


CANDIA
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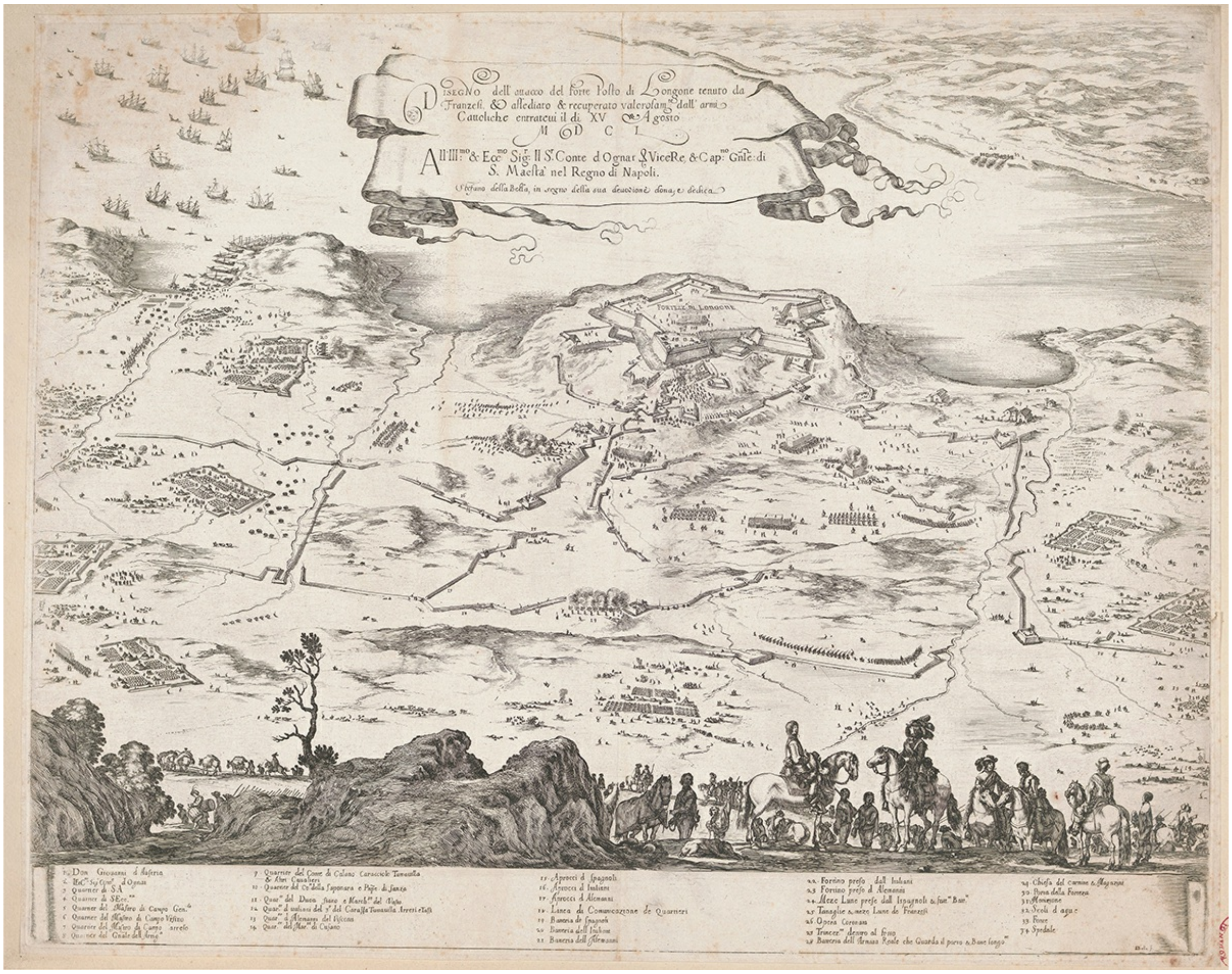
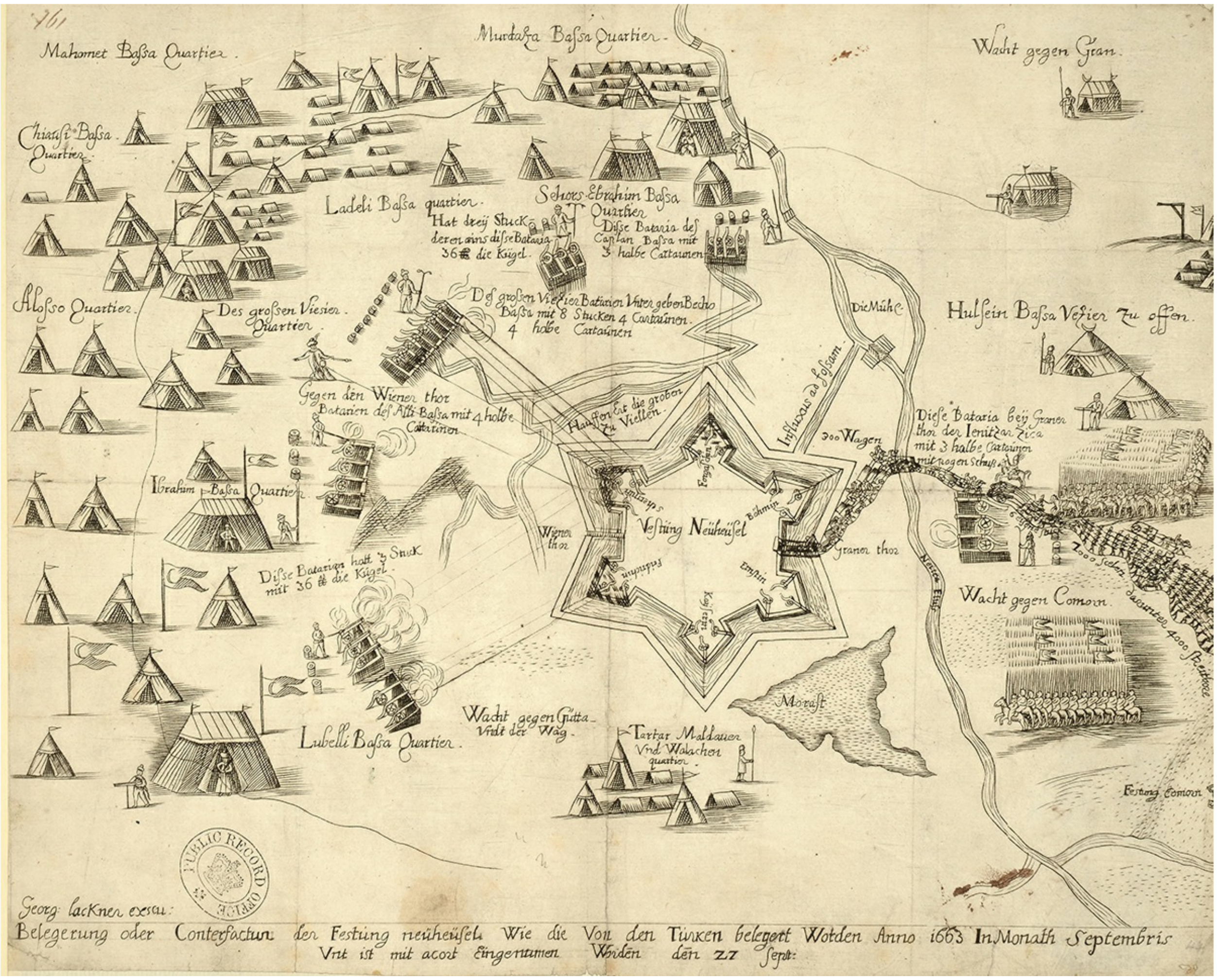
A.t Kaſteel van de Haven. B. De Haven. C. Arſenael. D. Poort Sabionera. E. Poort St Joris. F. Poort van Jeſus. G. Poort Panigra. H. Poort St Andrea.
I. Poort Tramatta. K. Poort van de Mole. L. Bolwerck Sabionera. M. Bolwerck Vitturi. N. Bolwerck van Jeſus. O. Bolwerck Martinengo. P. Bolwerck Betlehem. Q.
Bolwerck Panigra. R. Bolwerck S. Andrea. S. Berg Sabionera. T. Berg Vitturi. V. Berg Martinengo. 2. Fort St Demetrius. 3. Crepa Core. 4. Palma. 5. St Maria. 6.
Mocenigo. 7. Panigra 8. Ravelyn St Nicolo. 9. Ravelyn Betlehem. 10. Halvemaan Mocenigo. 11. Raveleyn Panigra. 12. Ravelyn St Spirito. 13. Reduyt St Andries.
I. Peeters excudit

CANDIA, CRETE In 1645, the Turks invaded the Venetian colony of Crete, which lay athwart the key grain-supply route from Alexandria to Constantinople. Most of the island was conquered in 1645–46, but the siege of the capital, Candia (Iraklion), lasted from 1647 until finally successful in 1669. Supply problems were a major problem for the Turks, as the Venetians sought to blockade the Dardanelles. In 1669, the garrison surrendered after division between the Venetians and allied troops.

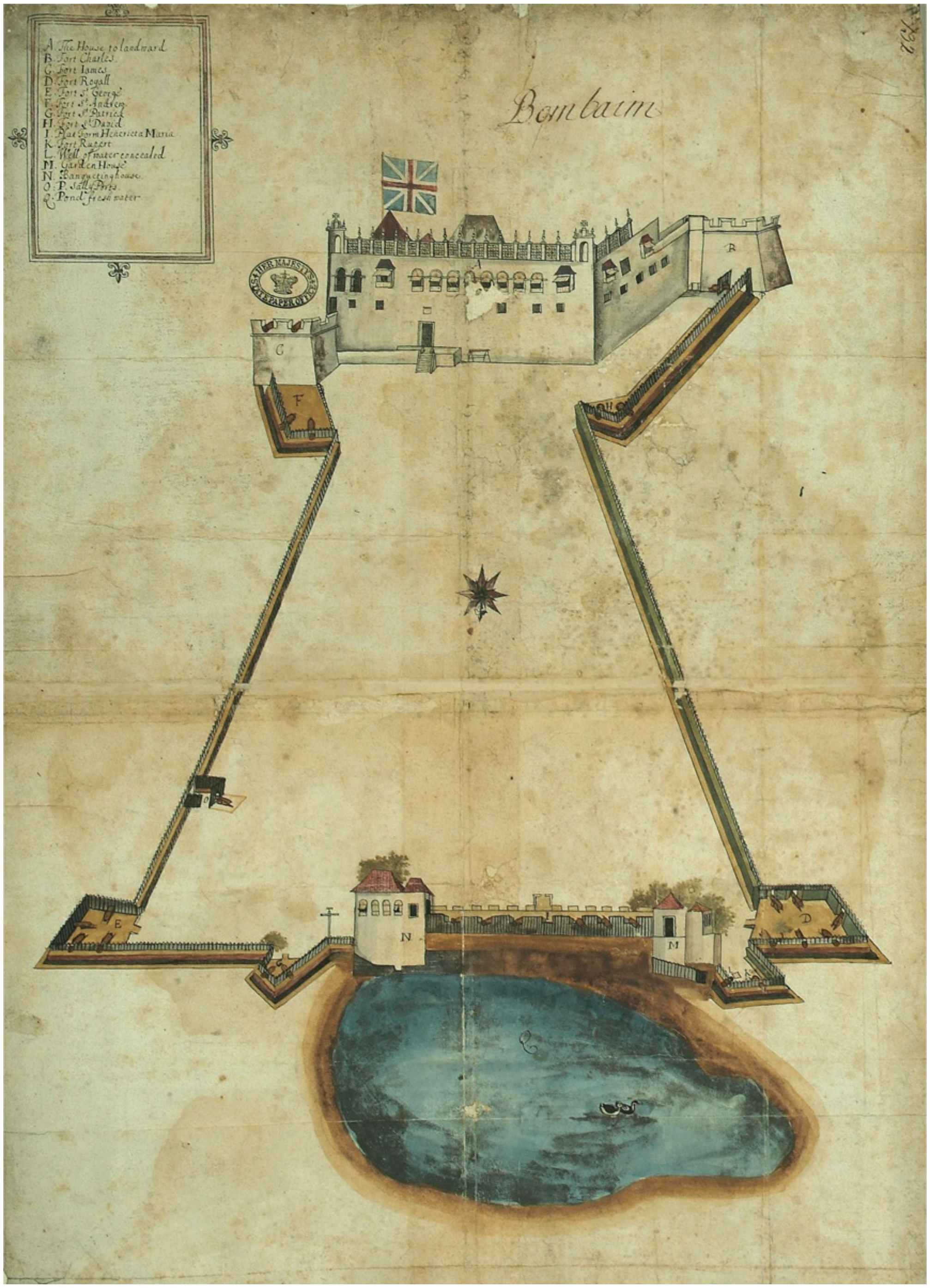
In general, European-style features were employed in these and other overseas fortifications. If there could be a degree of adaptation to local circumstances, as with the building material at St Augustine, it was less prominent than an attempt to reproduce the standard formula. This process was aided by the ubiquity of the basic building materials, stone, earth and timber. As with other forms of military capability, it is possible to emphasise both adaptation and standard forms. The flexibility of the European system was an important aspect of its strength, but was also a necessary response to pursuing goals across the world.


Disegno dell' attacco del forte Posto di Longone tenuto da Franzesi, & assediato & recuperato valorosam.te dall' armi Cattoliche entratevi il di XV Agosto M D C L.
All' Ill.mo & Ecc.mo Sig.r Il S.r Conte d'Ognat, ViceRe, & Cap.no Gnle: di S. Maestà nel Regno di Napoli.
Stefano della Bella, in segno della sua devozione dona, e dedica
FORTEZZA DI LONGONE

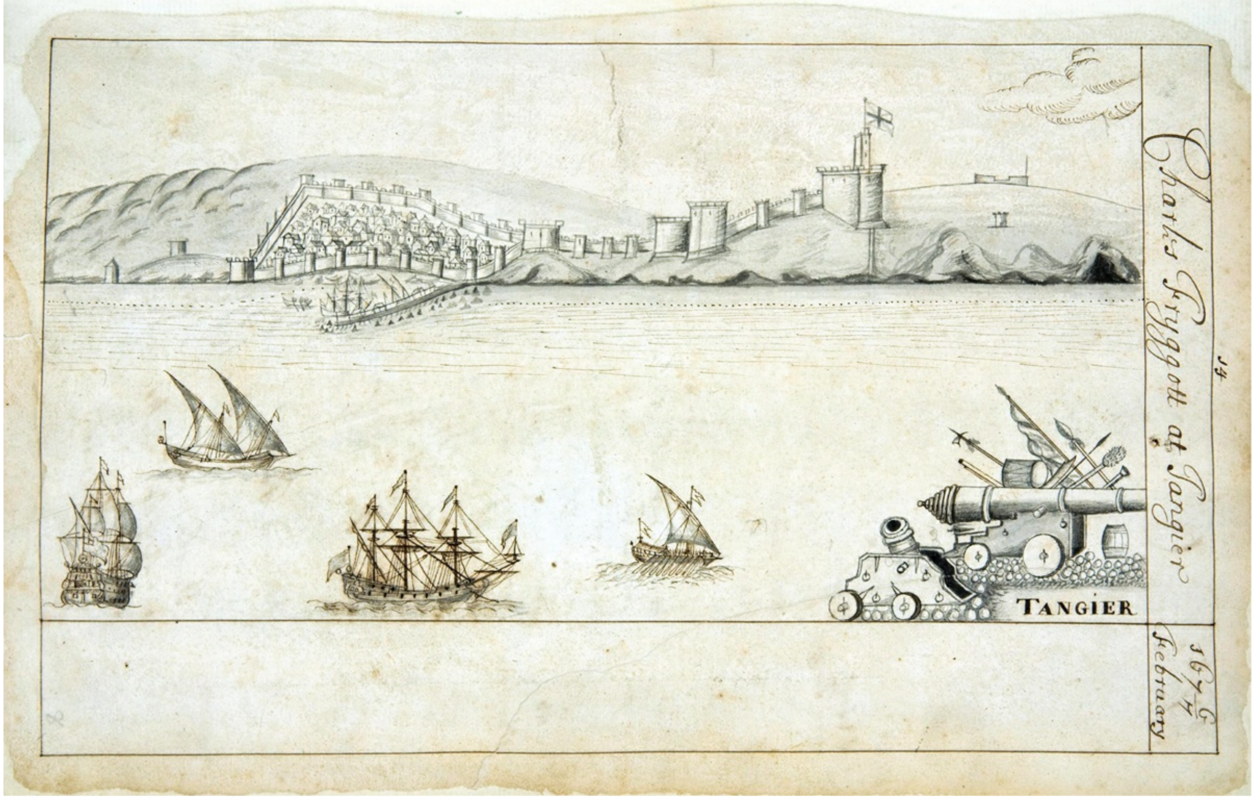
PORTO LONGONE, ITALY, 1650 Beginning in 1603, Spain built a large pentagonally shaped fortress (Forte San Giacomo) on the island of Elba above Porto Longone. This was an important position supporting the movement northward of Spanish troops from Naples. Designed by Don Garcia of Toledo, the fort fell to the French in 1646, with the Spaniards recapturing it in 1650 when France was weakened by civil war. Stefano Della Bella (1610–64), who etched this print of the recapture, was a noted engraver, including of military scenes.


761
Mahomet Baſsa Quartier.
Murdaſza Baſsa Quartier.
Wacht gegen Gran.
Chiauſi Baſsa Quartier
Ladeli Baſsa quartier.
Hat dreij Stuck deren ains diſse Bataria 36 die Kugel.
Schors Ebrahim Baſsa Quartier
Diſse Bataria deſ Caplan Baſsa mit 3 halbe Cattaunen
Aloſso Quartier.
Des groſsen Viesier Quartier.
Deſ groſsen Viezier Batarien Unter geben Becho Baſsa mit 8 Stucken 4 Cartaunen 4 holbe Cartaunen
Die Mühe
Hulſein Baſsa Veſier Zu offen.
Gegen den Wiener thor Batarien deſ Alli Baſsa mit 4 holbe Cartaunen
Hauffen ist die groben Zu Viellen.
Influxus ad foſsam
300 Wagen
Diese Bataria beij Graner thor der Ienitzar Zica mit 3 halbe Cartaunen mit pogen Schuſs
Ibrahim Baſsa Quartier
Wiener thor
Veſtüng Neüheüſel
Böhmin
Forgatschen
Graner thor
Neüe Fluſs
2000 Seelen
Wacht gegen Comorn.
Diſse Batarien hatt 3 Stuck mit 36 die Kugel.
Friedrichin
Erstin
Kayserin
4000 Reiterei
Moraſt
Wacht gegen Gutta Vndt der Wag.
Tartar Maldauer Vnd Walachen quartier
Lubelli Baſsa Quartier.
Festung Comorn
Georg: lacKner excu:
Beſegerung oder Conterfactur der Festüng neüheüſel Wie die Von den Türken belegert Worden Anno 1663 In Monath Septembris Vnt ist mit acort Eingennomen Worden den 27 Sept:

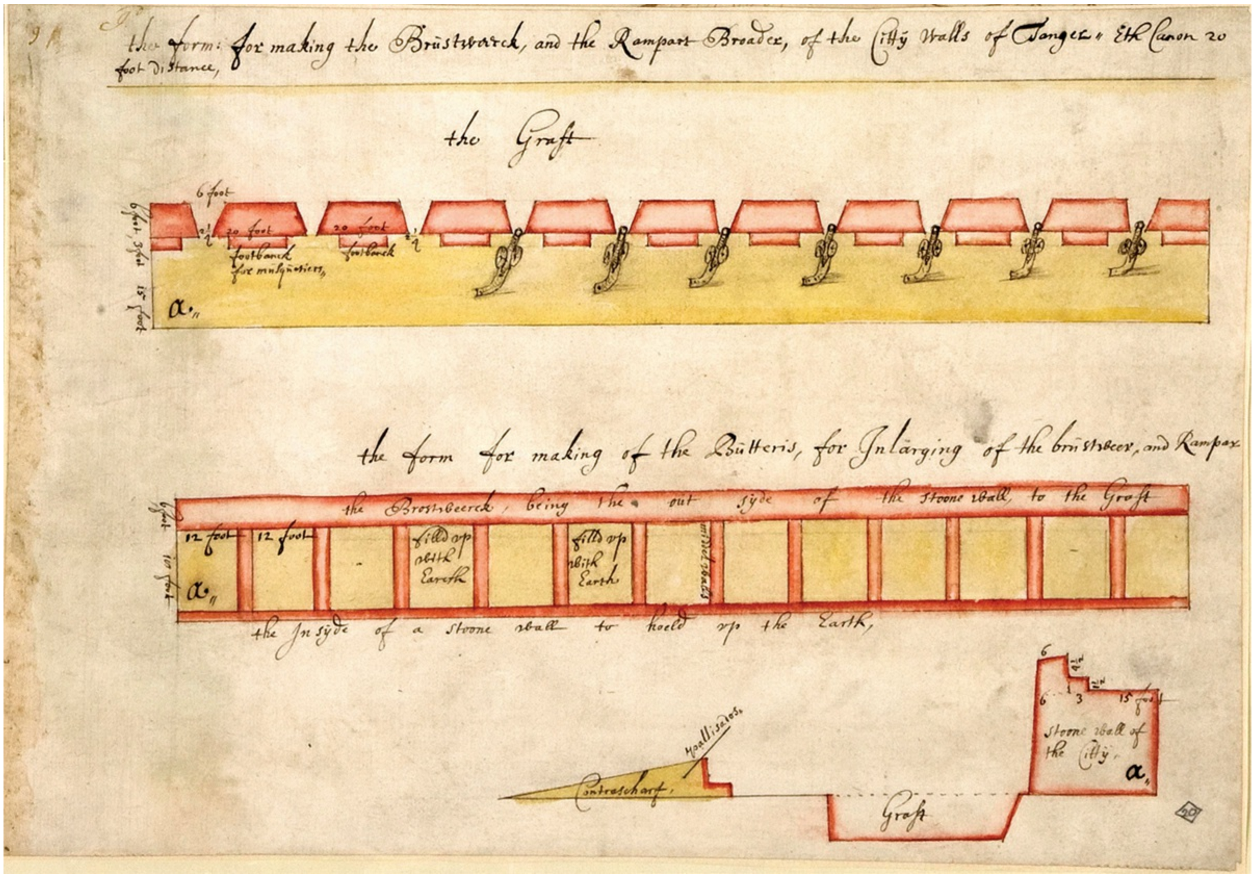
SIEGE OF NEUHÄUSEL (ALSO ÉRSEKÚYVÁR, NOVÉ ZÁMKY, UYVAR), SLOVAKIA This town in modern south-western Slovakia was captured by Ottomans, under Grand Vizier Fazil Ahmet Pasha, when they intervened in a contested succession in Transylvania. The siege began in August 1663 and the fort, which had been built in 1573–81 on a star plan, was captured on 13 September. In 1664, an Ottoman advance was blocked at St Gotthard near Graz. Under the Peace of Vasvár, the Austrians accepted the Ottoman position in Transylvania. The town was reconquered by the Austrians under Duke Charles V of Lorraine in 1685.


Bombaim
A. The House to landward
B. Fort Charles
C. Fort James
D. Fort Royall
E. Fort St George
F. Fort St Andrew
G. Fort St Patrick
H. Fort St David
I. Plat Form Henrietta Maria
K. Fort Rupert
L. Well of water concealed
M. Garden House
N. Banquetinghouse
O. P. Sally Ports
Q. Pond fresh water
HER MAJESTY'S STATE PAPER OFFICE
A
B
C
D
E
F
M
N
Q

PROPOSED ENGLISH FORT AT BOMBAY (MUMBAI), INDIA, 1665 Charles II of England, who had recently acquired, as part of his wife's dowry, the possession of Bombay transferred it to the English East India Company, which surveyed their new possession and sought to improve it. Sir Abraham Shipman was appointed the first of the English governors in 1662, but the Portuguese did not hand the island over until 1665. Taking over the Portuguese fortifications, the East India Company refortified the island, for example adding Sion (1669), Worli (1675), Sewri (1680) and Mazagon (1680) forts.



TANGIER, MOROCCO, 1677 Transferred from Portugal to England in 1662, alongside Bombay (Mumbai), as part of the dowry of Catherine of Braganza when she married Charles II, Tangier was held until 1684, but had to be defended against the Moors, notably in 1680. To protect the harbour and town from cannon fire, it was necessary to have an extensive defensive system, but this was costly. So also was the mole, shown in this illustration, which was designed to protect the harbour. Sultan Moulay Ismael (r. 1672–1727) was also successful in driving the Spaniards from bases at La Mamora (1681), Larache (1689) and Arzila (1691), but, hindered by weak artillery, a lengthy siege of Ceuta (1694–1720) failed.


the form: for making the Brustwarck, and the Rampart Broader, of the Citty Walls of Tanger, Eth Canon 20 foot Distance,
the Graft
6 foot
6 foot, 3 foot, 15 foot
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20 foot
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α,,
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filled up with Earth
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Contreschart,
Pallisadoes
Graft
6
6
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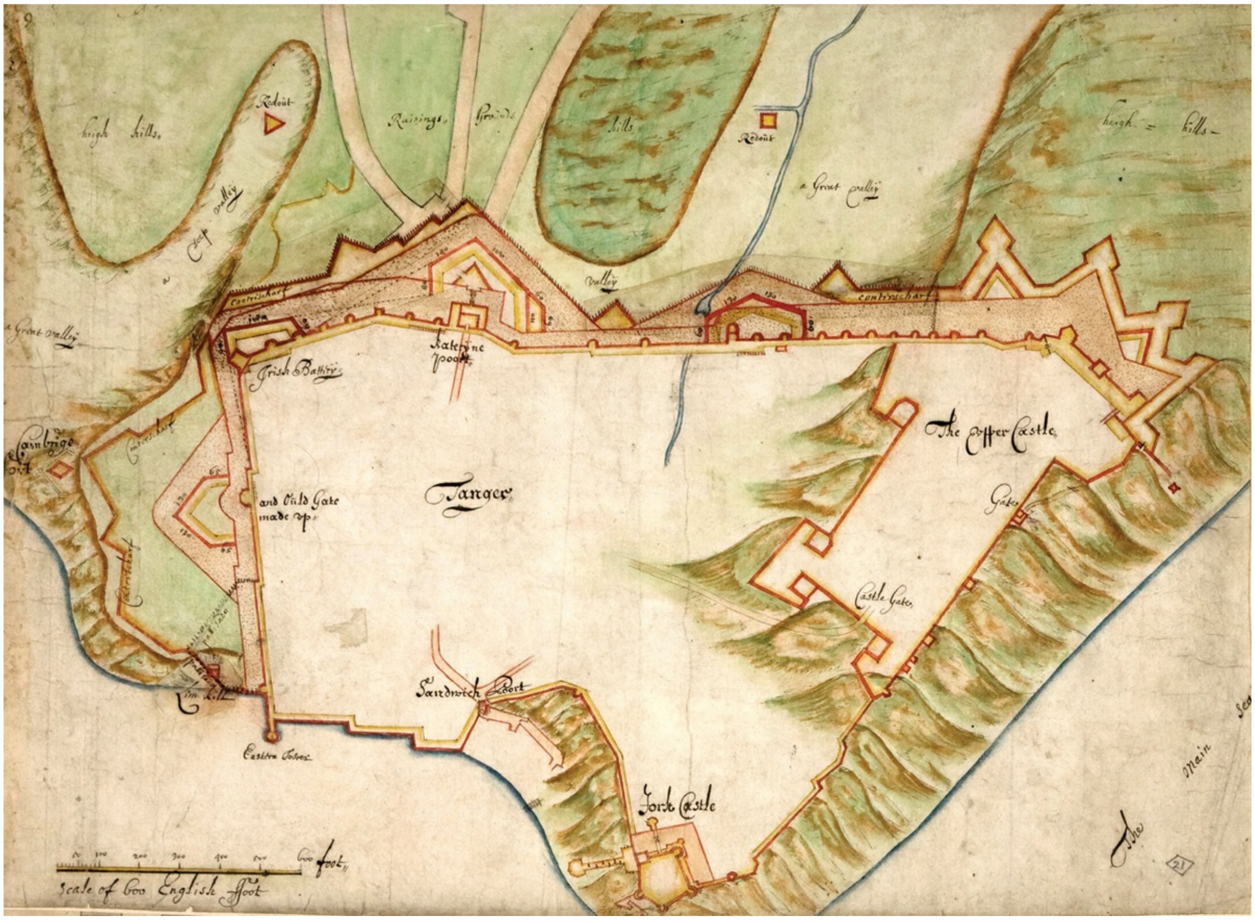
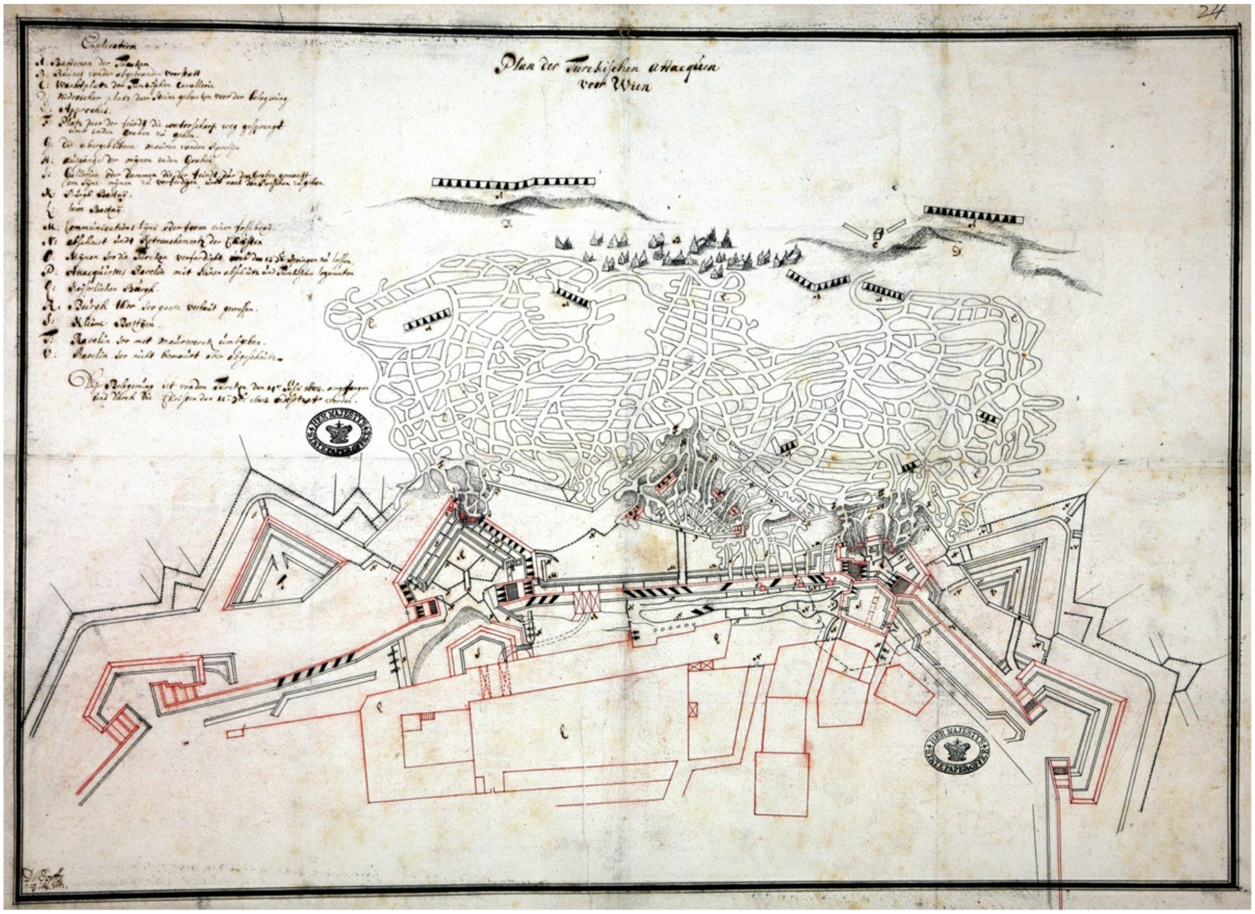
15 foot
Stoone wall of the Citty,
α,,
20

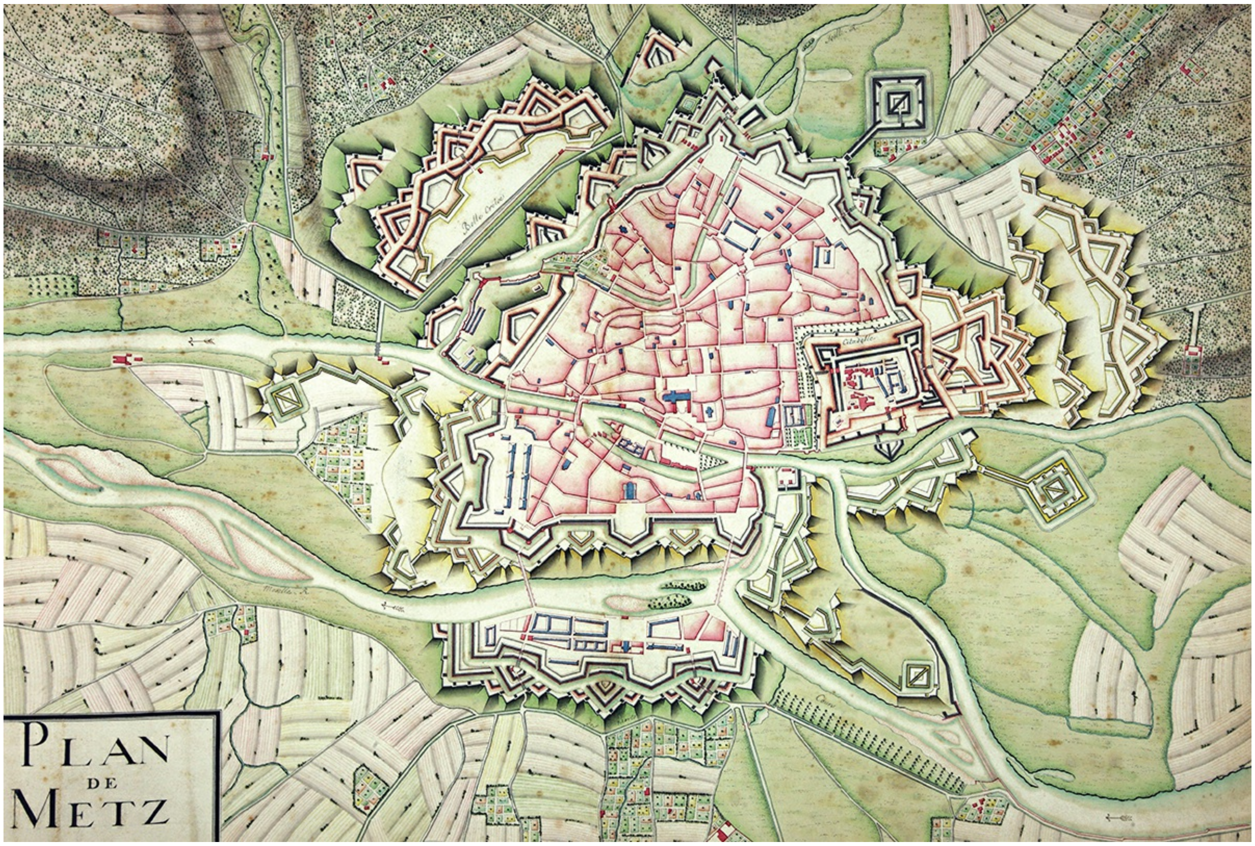
PLAN TO IMPROVE THE WALL OF TANGIER, MOROCCO, 1675 Plan, profile and section through the wall, graft [ditch] and counterscarp.


heigh hills
Redoût
a deep valley
Raisings
Grounds
hills
Redoût
a Great valley
heigh = hills
a Great valley
Valley
Contrescharf
contrescharf
Katerine poort
Irish Battery
Cambrige Fort
Contrescharf
Contrescharf
and Ould Gate made up
Tanger
The Upper Castle
Gates
Castle Gates
Sandwich Poort
Eastern Tower
York Castle
The main Sea
21
50 100 200 300 400 500 600 foot
Scale of 600 English ffoot

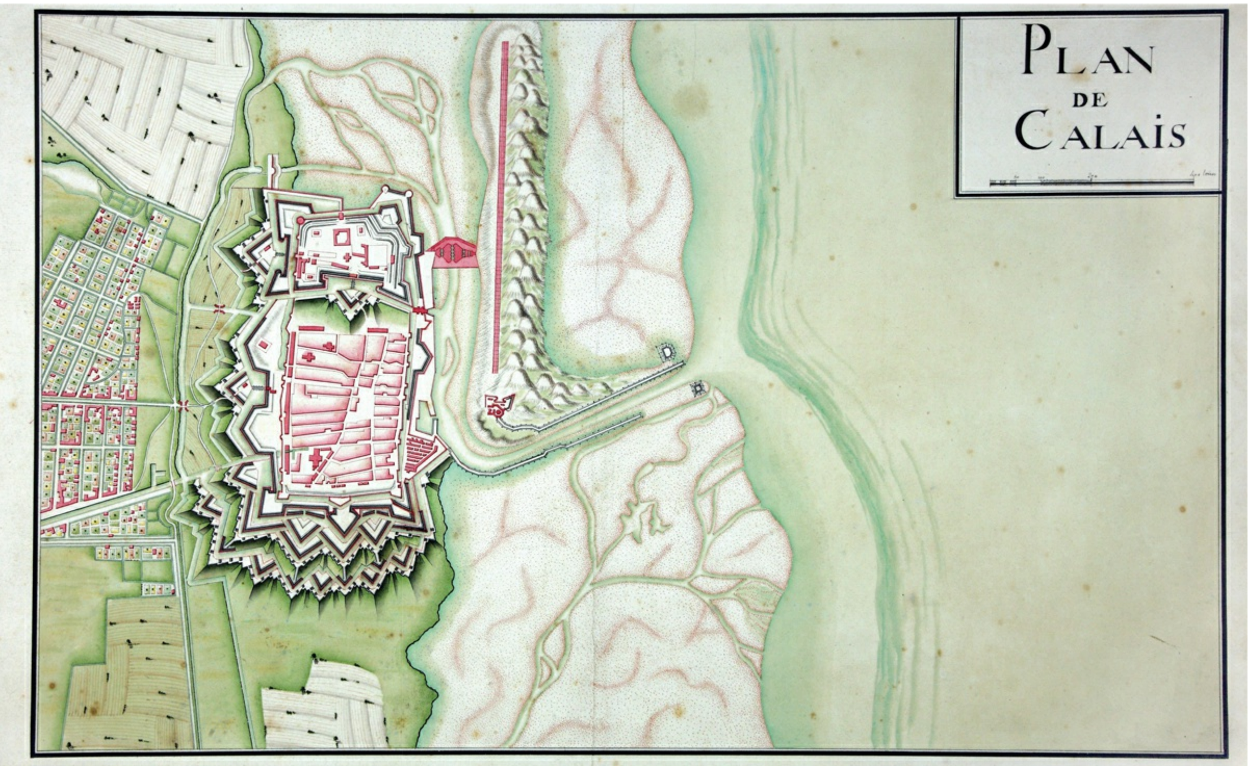
PLAN OF DEFENCES OF TANGIER, MOROCCO Sandwich and York as place names refer to Admiral Sir Edward Montagu, 1st Earl of Sandwich, and James, Duke of York, later James II.


Plan der Turckischen attacquen vor Wien
Explication
A. Batterien der Türcken
C. Wachtplatz der Türckischen Cavallerie
E. Approches.
K. Burgh Bastay.
L. Lewe Bastay.
N. Abschnitt oder Retrenchement der Christen
Q. Keyserlichen Burgh
S. Kleine Bastijen.
24

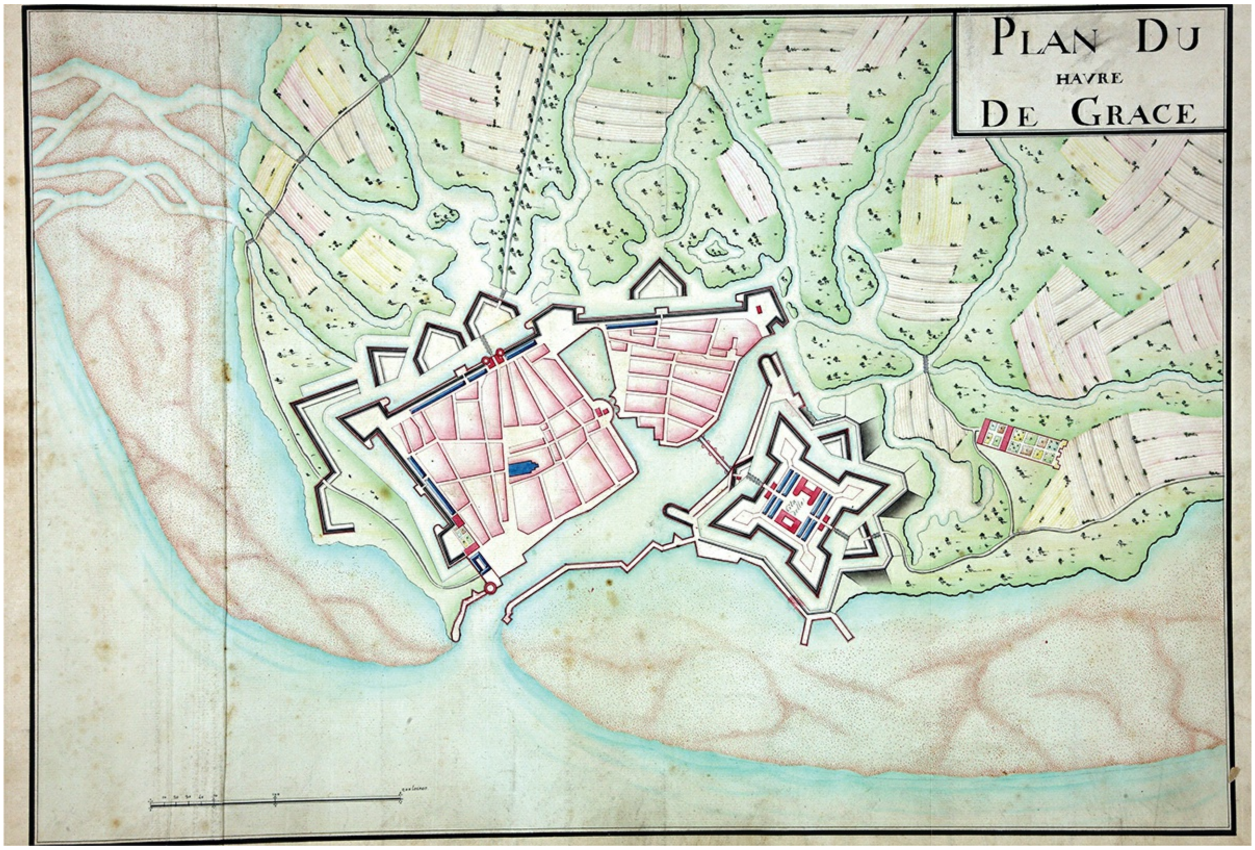
THE TURKISH SIEGE OF VIENNA, AUSTRIA, 1683 Having surrounded the city on 16 July, the Turks began building siegeworks, using both bombardments and mines to weaken the defences. The mines were particularly threatening and were designed to create breaches that would prepare the ground for assaults. The garrison suffered heavy casualties in its defence as well as losses from dysentery. In turn, the Turks, who were poorly prepared for a siege of such a powerful position with a very deep moat and large ramparts, suffered similarly. However, during August, the city's outer defences, where not covered by water features, steadily succumbed. Outgunned by the defenders, the Turks relied on undermining the defences, which they did with some success, leading to breaches in which there was bitter fighting. The city was saved by the victory of the relief army on 12 September.



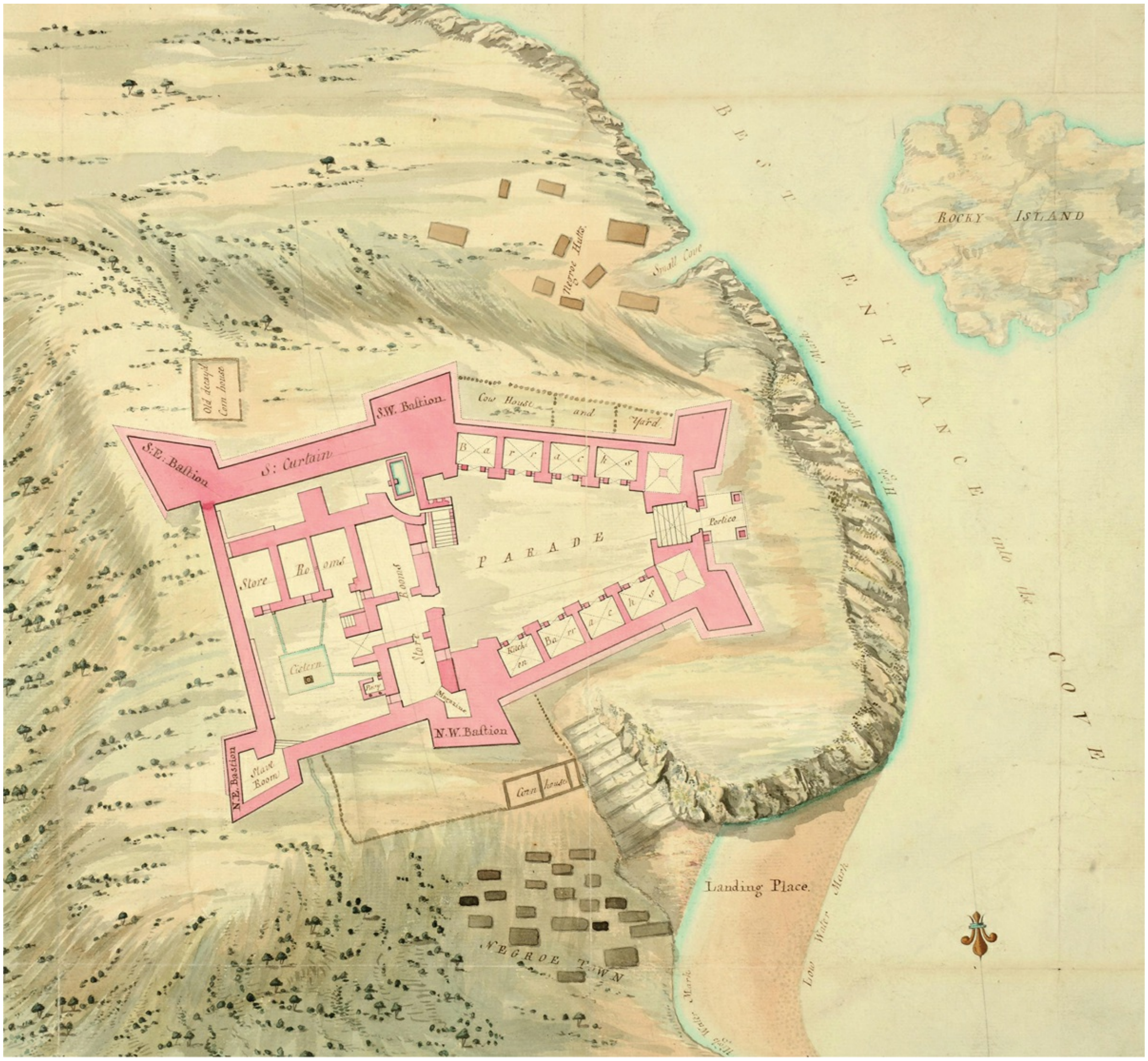
METZ, FRANCE, *c.*1695 Located at the confluence of the Meselle and the Seille rivers, the city was seized by Henry II of France in 1552. In response, the Emperor Charles V gathered his forces together and tried to rectify the situation. However, his attempt, at the head of 48,000–51,000 men, to regain Metz failed. It was foolish to mount a major siege late in the year. Charles' artillery, about 50 siege cannon, breached the city's walls, but the French had constructed new defences within them. As a reminder of the possibility of providing more than one interpretation, the harsh winter proved deadly for Charles's army, leading him to abandon the siege, not least when his main mine had been countermined by the French. In addition, Henry was able to force Charles to abandon the sieve by seizing Hesdin in Artois. The city was more strongly fortified by France in the late seventeenth and early eighteenth century, as it became a major base for operations against Germany.



CALAIS, FRANCE, 1695 Vauban visited Calais in 1675 and proposed extensions to the fortifications to protect the sluices. Work began in 1677 and was largely complete by the 1690s. The defences included barracks for up to 5,000 troops. Redoubts built in 1690 were designed to protect against naval attack. In 1694, English bomb vessels caused damage, leading to the building of a battery resting on wooden pilings, with other batteries following in 1696 and 1701.



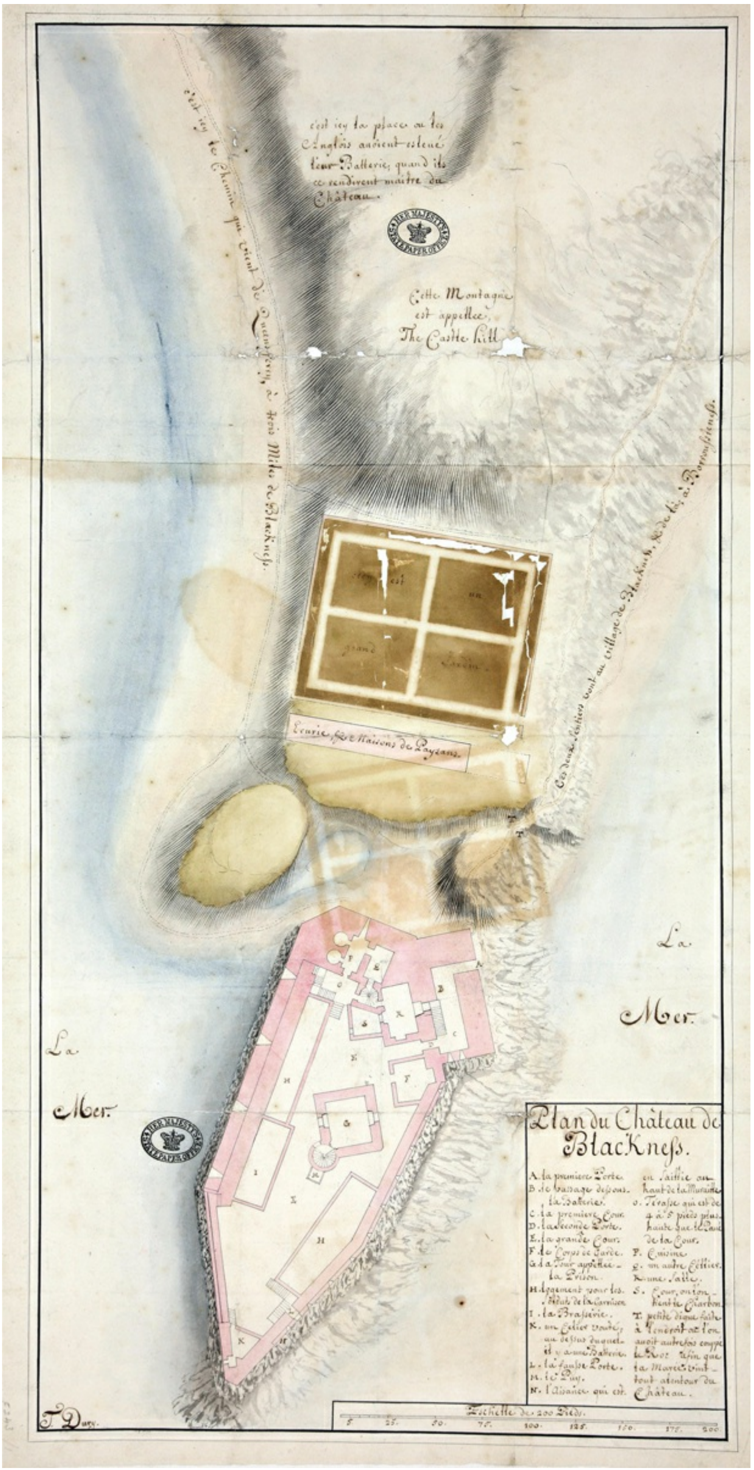
LE HAVRE, FRANCE, *c*.1695 The bombardment of Le Havre in 1694 by the English fleet demonstrated English control of the Channel after victory over the French at the battle of Barfleur in 1692. The vulnerability of the existing position led Vauban to propose a major improvement. However, Louis XIV did not accept his plans. This was probably due to the cost and reflected Louis' primary concern with his land frontiers and his army. This was shown to be a correct evaluation during the subsequent War of the Spanish Succession, in which England and France fought from 1702 until 1713. The only major attack on a French port then, that by the English on Toulon in 1707, required an advance overland by Austrian forces as well as naval action.


BEST ENTRANCE into the COVE
ROCKY ISLAND
Negroe Hutts
Small Cove
Old decayd Corn house
S.W. Bastion
Cow House and Yard
S.E. Bastion
S: Curtain
Barracks
PARADE
Portico
Store
Rooms
Rooms
Store
Cistern
Kitchen
Barracks
Magazine
N.W. Bastion
N.E. Bastion
Slave Room
Corn house
Landing Place
NEGROE TOWN
Low Water Mark
High Water Mark

FORT DIXCOVE, GHANA Built in 1683–98 by the English Royal African Company as a trading post for the gold and silver trade, this fort was besieged twice in 1712 by John Kanu, a local ally of Brandenburg-Prussia, which had built a nearby fort at Gross Friedrichsburg that was to be sold to the Dutch in 1717.

The Royal African Company had been granted, by its 1672 charter, monopoly rights over the English slave trade between Africa and the West Indies, but it lost this monopoly in 1698. Coastal forts served as protected bases for trade, but, aside from rotting in the humid climate, these bases were vulnerable to attack. The Dutch position at Offra and the French one at Glehue were destroyed in 1692 and the British one at Sekondi in 1694. The small garrisons relied for their ability to intervene in local conflicts on the forces of African allies. From 1730 to 1747, the near-bankrupt Royal African Company received an annual subsidy from the government in order to maintain its forts and settlements, but in 1750 the bankrupt company was abolished and the trade opened to all British subjects willing to pay a fee.

Justly Watson (*c*.1710–57), Director of Engineers, who surveyed the fort as well as others in West Africa in 1755–56, was sent in response to concern in the House of Commons about the defenceless state of the British positions. The Commons subsequently voted money to carry out his proposals for improvements. In 1868, the fort was transferred to the Dutch under the Anglo-Dutch Gold Coast Treaty, only to be returned in 1872 under the Gold Coast Treaty of 1871. The British then defeated the local African power, the Asante.


c'est icy la place ou les Anglois avoient esleué leur Batterie, quand ils se rendirent maître du Château.
Cette Montagne est appellee The Castle hill
c'est icy le Chemin qui vient de Queensferry, à trois Miles de Blacknesse.
Ces deux Chemins vont au village de Blackness, & de là à Borrowstouness.
Escurie & Maisons de Paysans
C'est un grand Jardin
La Mer.
La Mer.
Plan du Château de BlacKness.
A. la premiere Porte.
B. le passage dessous la Batterie.
C. la premiere Cour.
D. la seconde Porte.
E. la grande Cour.
F. le Corps de Garde.
G. la Tour appellée la Prison.
H. logement pour les Soldats de la Garnison.
I. la Brasserie.
K. un Cellier voûté, au dessus duquel il y a une Batterie.
L. la fausse Porte.
M. le Puy.
N. l'Aisance qui est en saillie au haut de la Muraille.
O. Terasse qui est de 4 à 5 pieds plus haute que le Pavé de la Cour.
P. Cuisine.
Q. un autre Cellier.
R. une Salle.
S. Cour, ou l'on tient le Charbon.
T. petite digue faite à l'endroit où l'on avoit autrefois coupé le Roc afin que la Marée vint tout alentour du Château.
Echelle de 200 Pieds.
25. 50. 75. 100. 125. 150. 175. 200.
T. Dary.

BLACKNESS CASTLE, SCOTLAND, 1696 The longevity of fortifications was amply demonstrated in the case of Blackness Castle, which was built on the south shore of the Firth of Forth by Sir George Crichton in the 1440s, probably on the site of an earlier fort. Crichton, a major landowner, was imprisoned in the castle, his major position, by his son James, when he tried to prevent him from eventually succeeding to his estates and title; but was rescued by the king. Strengthened in the mid-sixteenth century, Blackness fell to Oliver Cromwell's army in 1650, but was subsequently fortified again and in 1693 altered to improve its capacity to take heavy guns.

THE EIGHTEENTH CENTURY

> **‘It must be fortified. Well this being agreed to, the fortifications were well planned and immediately carried into execution, and all the time they were employed about this, there were several thousands also constantly at work to take away the hill and blowing it up like fire and smoke. They both come on apace and very soon there will be no hill; but there will be fine fortifications…**
>
> **All these works put together may be very well defended by 10,000 men, an army sufficient to meet any power in the field that can attack this place; but one may as well fight under cover as not.’**

George Paterson was greatly impressed by the speed of the work when he visited Bombay (Mumbai) in 1770. The British had gained the city from Portugal in 1662 as part of the dowry of Catherine of Braganza when she married Charles II. Paterson thought the square fort in which the British had sheltered against Mughal assault in 1686 ‘by no means fit to sustain a modern attack’. However, Paterson noted the more modern fortifications going up, including those on a hill overlooking the city.

More generally, expanding European control was anchored by fortifications. This could be seen with the Spanish Empire, at the fortress at Pensacola in west Florida founded in 1698, or that at Monterey, established in 1770 and later the capital of New California, or those along the Bio Bio river in Chile, such as the fortress of Nacimiento. Pondicherry, the major French base in India, was well-fortified, with a rampart with bastions on the vulnerable side facing the land constructed in 1724–35, and a rampart on the less vulnerable coastal side in 1745.

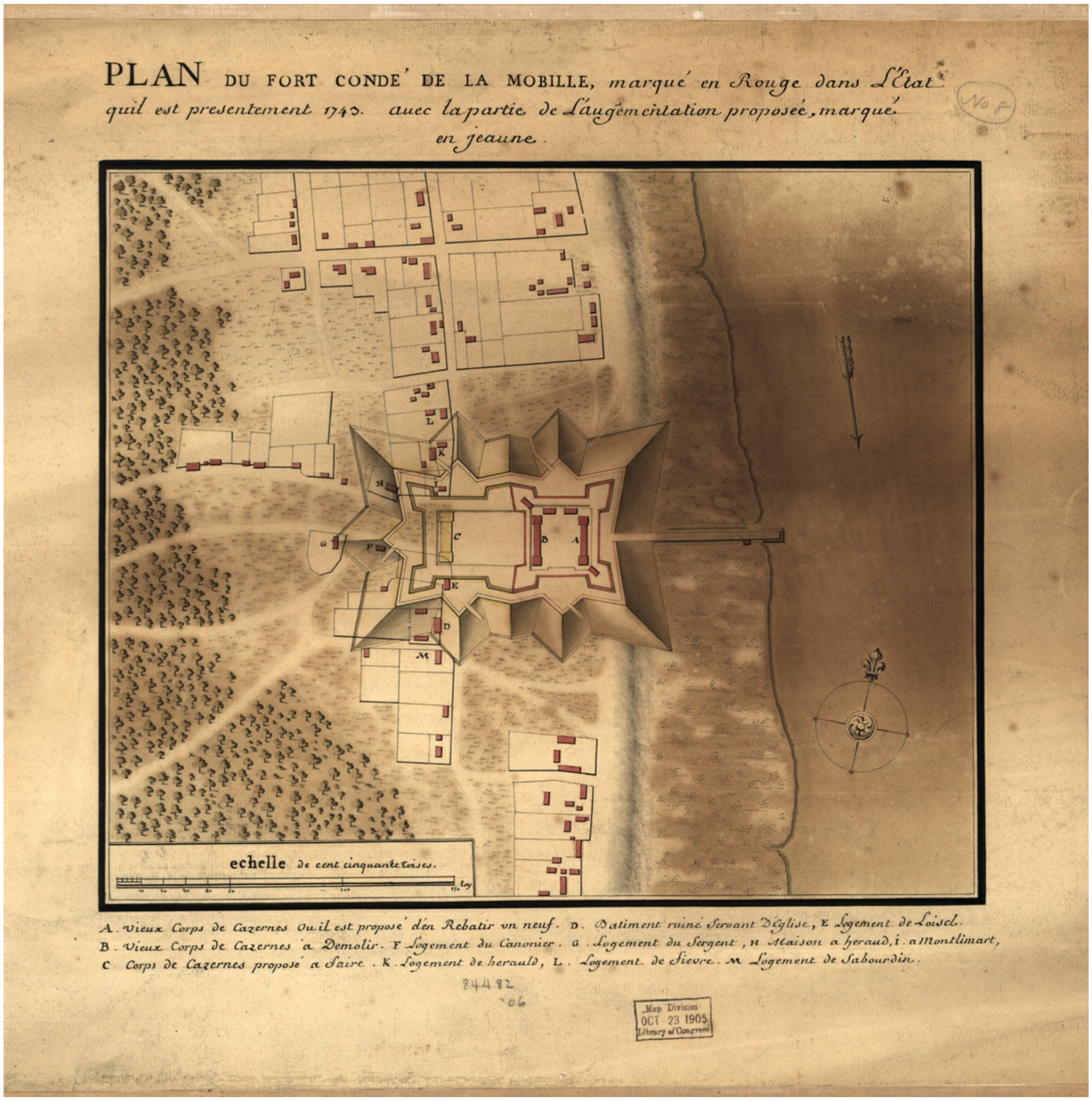
NORTH AMERICAN FORTIFICATION

In North America, forts enhanced the French position in the fur trade on a continuing pattern. They were intended to bring the hoped-for route to the Pacific. Fort St Charles (1732) on the Lake of the Woods was followed by Fort Maurepas (1734) at the southern end of Lake Winnipeg. Fort Dauphin (1741) established a French presence on the western shore of Lake Winnipegosis, and Fort à la Corne (1753) was founded near the Forks of the Saskatchewan, a crucial node of native trade routes. The names of forts reflected their significance. Maurepas was the Minister of the Marine, the key figure in governing France’s colonies.

In turn, the British built forts into the interior. Indeed, competing attempts to establish forts led to conflict in the Ohio River Valley in 1754, provoking war between the two powers. Outnumbered by the French and in an exposed position, George Washington was forced to surrender that year. British and French fort building to the south of the Great Lakes was another major cause of tension, with positions such as Oswego highly contentious.

The Europeans held no monopoly of fortifications in these regions. For example, eastern North Americans had many palisaded villages in the seventeenth century and, with the introduction of firearms, European-style bastions appeared to defend the villages against crossfire. There was at least one example of a masonry fort in New England. However, the Native Americans usually abandoned their forts when Europeans approached them, especially when the latter had cannon. They had learned that forts could be death traps. The Fort of the Fox (or Mesquakie) on the Illinois Grand Prairie had a heavily fortified palisade and maze of trenches that protected the Fox from French gunfire in 1730, but the Fox lacked cannon. More generally, a fort could be a death trap or an invaluable equaliser, depending on the overall situation.

European-colonial forts mounted cannon, but there was a major difference between the European forts designed to fend off Native American attacks, which were based on simple palisade designs, and the more elaborate fortresses built to resist European-style sieges, such as Charleston and Halifax where the British followed the models of Vauban’s fortifications, or St Augustine in Florida where the Spaniards held off British attack.


PLAN DU FORT CONDE' DE LA MOBILLE, marqué en Rouge dans L'Etat quil est presentement 1743. auec la partie de L'augementation proposée, marqué en jeaune.
No 8
echelle de cent cinquante toises.
A. vieux Corps de Cazernes Ou il est proposé d'en Rebatir vn neuf. D. Batiment ruiné Servant D'Eglise, E Logement de Loisel.
B. vieux Corps de Cazernes a Demolir. F Logement du Canonier. G. Logement du Sergent, H Maison a heraud, I. a Montlimart,
C Corps de Cazernes proposé a faire. K. Logement de herauld, L. Logement de Fievre. M Logement de Sabourdin.
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Map Division
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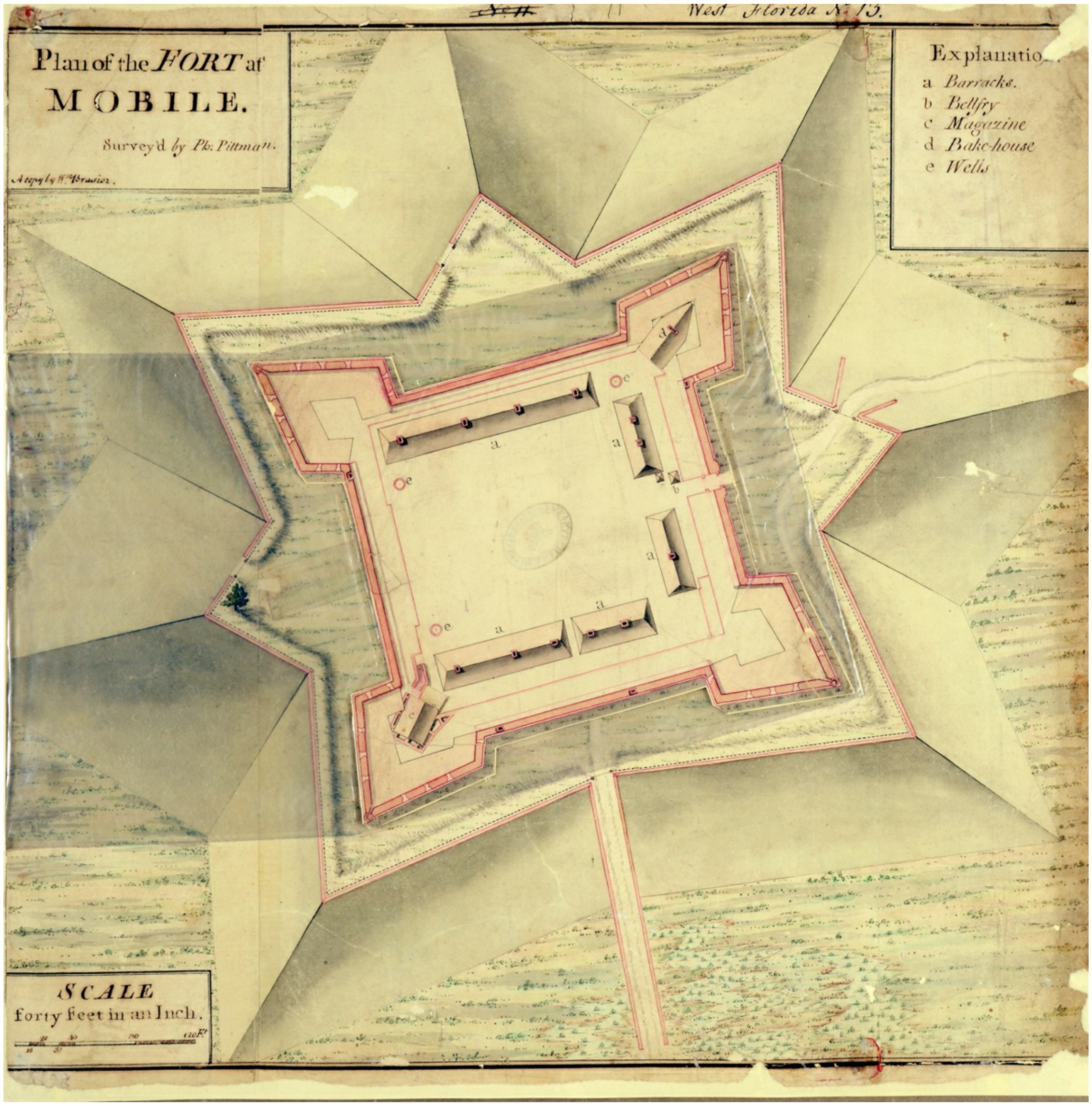
Library of Congress

FORT AT MOBILE, NORTH AMERICA In 1702 Fort Louis was laid out by the French with bastions and batteries. In 1710, however, the wood was so rotted by humidity and decay that the cannon could not be supported. The garrison suffered from an absence of fresh meat, from insufficient swords, cartridge boxes, nails, guns and powder, from demoralisation and desertion, and from the lack of a hospital. Relocation led first to a temporary fort and then to a new brick fort with a stone foundation, which was begun in 1723 and renamed Fort Condé. The area was ceded to Britain under the Peace of Paris of 1763, being renamed Fort Charlotte in honour of George III's wife. Captured from Britain by Spain in 1780 after the walls were breached by cannon in a two-week siege, the fort, renamed Fort Carlota, was seized from Spain by American forces in 1813 without the two powers being at war. This stopped Britain using Mobile to trade with Native Americans. Under pressure during the Peninsular War with France, Spain was too weak to respond. In February 1815, the British were about to attack Mobile when their war with the USA, the War of 1812, came to a close. The fort was subsequently razed, although a reduced-size replica has since been built.


West Florida No. 13.
Plan of the FORT at MOBILE.
Survey'd by Ph: Pittman.
A copy by Wm. Brasier.
Explanatio
a Barracks.
b Bellfry
c Magazine
d Bake-house
e Wells
SCALE
forty feet in an Inch.

MOBILE, NORTH AMERICA, *c.*1770 Having received East and West Florida from Spain and part of Louisiana from France under the Peace of Paris in 1763 (in return for returning the conquest of Cuba), the British surveyed their new possessions. The French fort, built in 1712 as Fort Louis de La Louisiane and renamed Fort Condé in 1723, was now renamed Fort Charlotte after George III's new wife and repaired. In 1780, a two-week Spanish siege saw a bombardment that led to the breaching of the walls. The garrison then surrendered. The British relief attempt, from Pensacola, held up by difficult river crossings, did not arrive in time. A British counterattack in 1781 failed. This plan shows the barracks and magazine, as well as the crucial sustenance offered by wells and a bakehouse.

More generally, the European presence in part rested on an ability and willingness to dig. In 1788, Charles, 2nd Earl Cornwallis, the British commander in India, took an interest in the purchase of entrenching tools. Having already ordered '4,000 good iron shovels', he wanted '2,000 iron spades to be made immediately'.

Powerful European-colonial fortifications were of only limited use against European assailants who had naval superiority and were not weakened by tropical diseases, as the British demonstrated when they took Louisbourg on Cape Breton Island from the French in 1745 and, for good, in 1758, and Québec in 1759. The latter surrendered after a French army that had sallied forth was defeated: the fortifications themselves were not damaged and indeed saw off a French siege in 1760 after a similar defeat. Such fortifications were generally able to resist assailants who lacked the skills, resources and organisation required for a lengthy siege, and in the eighteenth century most major fortifications erected by European forces survived native siege or attack. In North Africa, Spanish-held Ceuta resisted Moroccan sieges in 1694–1720 and 1732, and Melilla another in 1774–75. On the other hand, the Algerians took Oran from Spain in 1708, only for Spain to regain it in 1732 with a major expedition.

The major overseas centres of European power did not fall to non-European peoples. No Native Americans could have mounted attacks comparable to those by the British against Louisbourg. Spanish-ruled Manila fell to the British in 1762, and not to a rising in the Philippines nor to an attacking Asian power. Colonel George Monson recorded:

> **'An eight gun battery was finished about three hundred yards from the wall the 2nd of October at night, and opened the 3rd in the morning on the south-west bastion which immediately silenced the enemy's guns and made a breach in the salient angle of the bastion, the fourth at night batteries were begun to take off the defences of the south-east bastion and of the small bastion on the west side of the town; which was opened the fifth by ten o'clock in the morning and had so good an effect, that the general gave out orders for storming the place next day; which was done about seven in the morning, with very little loss on our side.'**

PROBLEMS IN SUSTAINING FORTRESSES

Due to a lack of interest and resources as well as the scale of commitments, many fortified positions were weak and poorly garrisoned. In 1710, the wood of the French fortress at Fort Louis (later Mobile), which had been built in 1702, was so rotted by humidity and decay that it could not support the weight of the cannon. The garrison suffered from an absence of fresh meat, from an insufficient supply of swords, cartridge boxes, nails, guns and powder, from demoralisation and desertion, and from the lack of a hospital. The same also applied to most of the forts in West Africa that protected European trading positions, notably for the slave trade.

Logistics was another key problem in sustaining fortresses. In 1778, Patrick Henry, Governor of Virginia, justified abandoning an attempt to capture distant Detroit from the British: ‘a post will be difficult to maintain while the great intermediate country is occupied by hostile Indians.’

Once the Thirteen Colonies became independent in 1783, the Americans benefited from fortifications such as Fort Washington (now Cincinnati), established in 1789, but the limited number of American regular troops meant that there were insufficient for any widespread garrison policy. Furthermore, there and elsewhere (for example in Russia east of the Caspian Sea), garrisons could only work as part of an expansionist policy if they were accompanied by the ‘pacification’ of areas brought under control earlier. If not, expansion simply brought the need for more garrisons. To protect their position north of Mexico from Native American attack, Spain attempted to create a cordon of fortified bases, but the Native Americans travelled between them with no difficulty.

SIEGES

Within Europe, sieges were important as fortified positions anchored political power, contained military supplies and controlled communication routes, both roads and rivers. In his *Rêveries* (1757), written in 1732, Marshal Saxe, who, as a leading French commander in the 1740s, focused on a war of manoeuvre, criticised the cost of Vauban’s fortifications, but also wrote of

> **‘the usefulness of fortresses; they cover a country; they subject an enemy to the necessity of attacking them, before he can penetrate further; they afford a safe admission to your own troops on all**

occasions; they contain magazines [supply dumps], and form a secure receptacle, in the winter time, for artillery, ammunition, etc.'

Sieges had become more formidable undertakings because of advances in fortification technique associated in particular with Vauban and because of the size of armies available in Western Europe from the late seventeenth century. This situation, to a degree, prefigured that during the late nineteenth century, although not World War I.

During the War of the Spanish Succession (1701–14), Louis XIV of France sought to acquire fortresses on or near his frontiers, such as Friedlingen, Alt-Breisach, Freiburg, Kehl and Philippsburg, and those that would aid a strategic advance, for example Villingen, which controlled the route to his ally Bavaria down the Upper Danube and thus represented a way to protect Bavaria against Austrian attack. Fortresses played a major role in peace negotiations: in 1712, Louis insisted on the retention of Lille, Tournai, Condé and Maubeuge as part of a peace settlement. The strength and extent of the French fortification system certainly limited attempts to invade France, as in 1708–11 and 1743. Indeed, Lord Cobham referred to France's 'almost impenetrable Barrier of Alsace, Lorraine or the Netherlands'.

Other powers were also concerned by the strategic implications of the availability or not of fortresses. In 1709, Victor Amadeus II of Savoy-Piedmont pressed the British envoy: 'that the demolishing of Montmelian by the enemy has left all Savoy uncovered, and that upon any rupture with France, how impossible it is to preserve Savoy, or any footing on the other side the mountains [the Alps], except, upon the treaty of peace, the allies will think of procuring him' an equivalent.

The relationship with field armies remained a crucial issue, with a parallel provided by the role of naval power in the defence of island fortresses. The British were able to besiege and capture Lille in 1708 because John Churchill, 1st Duke of Marlborough had earlier heavily defeated the French army at the battle of Oudenaarde. Lille was well-fortified (it is still an impressive site), ably defended by a large garrison, and there was the prospect of support from a relief army. A poorly coordinated Allied attack on too wide a front on 7 September left nearly 3,000 attackers dead or wounded. The Allied attack was only successful when artillery fire was concentrated, making a number of large breaches, and French diversionary attacks were beaten off. The citadel finally capitulated on 19 December, after a siege of 120 days that cost the besiegers 14,000 casualties. Similarly, Mons and Ghent were captured in 1709 only after Marlborough's victory at Malplaquet, a difficult victory, but a victory nevertheless.

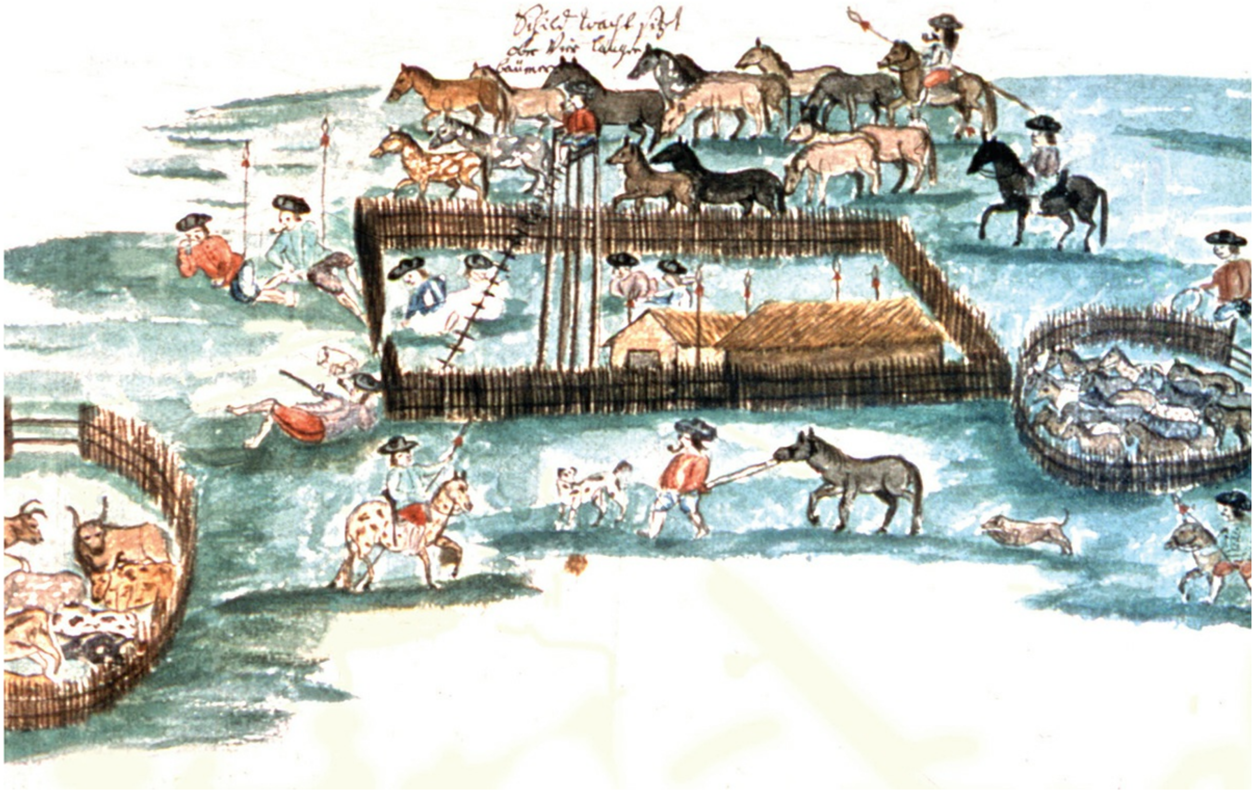
In 1744, the British diplomat Robert Trevor wrote of the Dutch barrier fortresses in the Austrian Netherlands [Belgium]:

> **'I dare not preach up the doctrine of putting their fortresses into an impregnable condition… I had rather see the places secured by an army in the field, and opposed to the enemy; than the army secured in the places. I confess, I am one of those, who cannot understand how a country is the weaker, in proportion to the number of fortified places it has; which must however be the case if they are to absorb, instead of ekeing out, the troops of a state.'**

Fortresses could be expected to take a battering in any campaign. In 1761, the British fired 17,000 shot and 12,000 shells from a battery of 30 guns and 30 mortars in their successful siege of the French citadel of Belle-Île on an island off the coast of Brittany. Twenty years later, Captain James Horsburgh, British Adjutant-General in Gibraltar, recorded of a not particularly important day in the unsuccessful Spanish siege during the War of American Independence: 'Their fire in the last 24 hours amounted to 203 shot and 33 shells.' Fortresses also fired a considerable weight of shot. Besieged unsuccessfully by the Prussians from 13 to 30 July 1760, Dresden, the capital of the Electorate of Saxony, fired 26,266 cannon shot from its 193 pieces of artillery.

Storming remained important in taking forts. For infantry, cavalry and siegecraft, there was a consistent tension between firepower and shock tactics. The choices made reflected circumstances, experience, the views of particular generals and wider assumptions in military society; and these choices were not dictated by technology. The focus on attack in part represented a cultural imperative in the face of the disincentive provided by the growing strength of defensive firepower, but, in practice, this strength did not preclude advantages for attacking forces. As a reminder of the variety of factors involved at all levels, and strategically as well as tactically and operationally, the prestige of the attack, rather than a reliance on ideas and practices of deliberate siegecraft, could, for example, encourage attempts to storm fortresses. However, so could a need for speed, both in order to press on to achieve results and deal with logistical problems which were greatly exacerbated by lengthy sieges.

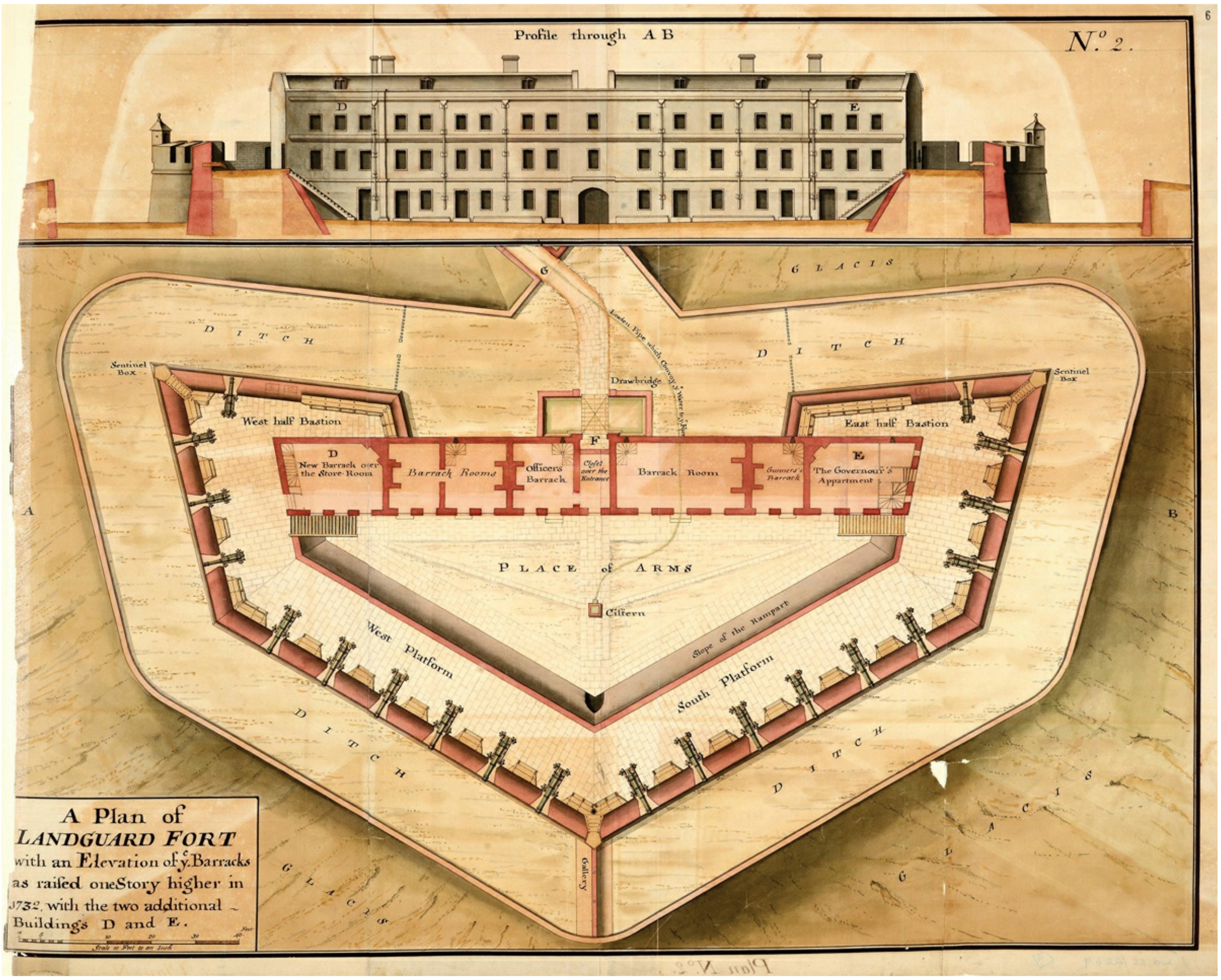
These factors formed a long-standing mix. In 1714, three Franco-Spanish storming attempts on Barcelona were repulsed, but the outnumbered defenders then accepted terms. Bavarian, French and Saxon forces successfully stormed Prague in 1741, the French Charleroi in 1746 and the major Dutch fortress of Bergen-op-Zoom in 1747, and the British Seringapatam, the capital of Tipu Sultan of Mysore, in southern India in 1799.



STOCKADE FORT, PARAGUAY, EIGHTEENTH CENTURY The tendency in works on fortification is to focus on high-specification works, but most fortifications, both in the past and at present, are much more modest and fit for purpose accordingly. This small fort was designed to help protect Spanish settlements against the possibility of Native attack. Jesuit mission territories were an added complication in this region.

NEW PROJECTS

There was interest, notably in France, in new projects for fortification, especially from Marc-René, Marquis de Montalembert (1714–1800). A man of great schemes, but not given to costing proposals, detailed design or checking the practicalities of local topography, he advanced a series of bold projects from 1776 to 1797. In a pattern more generally the case with many of the theorists of the period, Montalembert was concerned primarily with the basic design which, to him, determined whether or not a fortification was capable of withstanding attack. For him, reason was independent of nature and dominated it: the accidents of terrain and specificities of location could be subordinated to the theoretical plan. With cause, this approach was criticized by contemporaries in France. The debate testified both to interest in improvements and to commitment to an explicitly rational solution.


Profile through A B
N.o 2.
D
E
G
G L A C I S
D I T C H
D I T C H
Sentinel Box
Sentinel Box
Drawbridge
Leaden Pipe which Convoys ye Water to ye Fort
West half Bastion
East half Bastion
F
D
New Barrack over the Store-Room
Barrack Rooms
Officers Barrack
Closet over the Entrance
Barrack Room
Gunners's Barrack
E
The Governour's Appartment
A
B
P L A C E of A R M S
Cistern
Slope of the Rampart
West Platform
South Platform
D I T C H
D I T C H
G L A C I S
G L A C I S
Gallery
A Plan of
LANDGUARD FORT
with an Elevation of ye Barracks
as raised oneStory higher in
1732, with the two additional
Buildings D and E.
Scale 10 Feet to an Inch

LANDGUARD FORT, ENGLAND This fort, designed to protect the mouth of the River Orwell and thus the port of Harwich, was begun in the 1540s and improved under James I (r. 1603–25). It was improved in the eighteenth century, with a new battery in 1717. A new fort on an adjoining site was begun in 1745 with pentagonal bastions. This reflected the sense of vulnerability arising from French-backed pro-Jacobite invasion plans in 1744 and 1745–46.

New batteries were added in the 1750s and 1780s. Essex was seen as an invasion risk as a force landed there would not need to cross the Weald, the Downs and the Thames. Such an invasion could be mounted from Dunkirk. Moreover, the British fleet was weak on the coast. In 1743–45, the Jesuits pressed for a landing at Maldon, and in January 1746 this was one of the sites the French considered.

THE ROLE OF FORTRESSES IN WAR

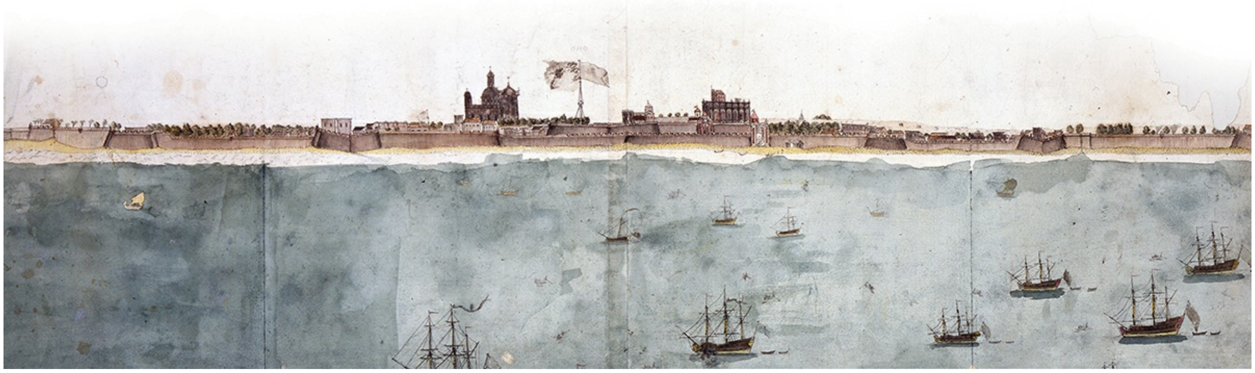
In Eastern Europe, where there were far fewer fortifications and no system of advanced fortresses, it was easier for the participants in the Great Northern War (1700–21) than those in the War of the Spanish Succession (1701–14) to make major advances, as when the bold Charles XII of Sweden invaded Poland in 1701, Saxony in 1706 and Ukraine in 1708. However, individual fortresses could be important in Eastern Europe, not least as the way to secure control of a region. Thus, the capture of Narva in 1704 and of Viborg, Reval, and Riga in 1710, by the Russian forces of Peter the Great, and of Stettin (1713), Stralsund (1715), and Wismar (1716) by Sweden's western assailants, Denmark and Prussia, were crucial stages in the collapse of the Swedish Empire. Charles XII himself died while besieging the Norwegian fortress of Fredrikshald in 1718.

Similarly, fortresses such as Ochakov and Izmail played a major role in successive Russo-Turkish wars. Moving on to the defensive created serious problems for the Turkish Empire, both structurally and in terms of ethos. There was a marked deficiency in preparations for defences. Nevertheless, key fortresses such as Ochakov were improved. This Turkish emphasis on the defensive and improvement to fortifications affected strategy. The greater strength of fortresses, the determination to secure territorial gains and the need to dominate supply routes ensured that sieges were very significant in campaigning north of the Black Sea, as well as in the Danube Valley where they had for long been to the fore.

The Turkish fortresses on the rivers athwart Russia's advance into the Balkans, such as Izmail and Silistra on the Danube, played a key role in campaigns, affecting Russian mobility. The vigorous Sultan Selim III of Turkey (r. 1789–1807) shared in the pride in constructing new fortresses shown by many other monarchs. With a predisposition to search for signs of decline, Western observers, however, were generally scathing about Turkish fortresses. George Frederick Koehler, a German in the British artillery who inspected Turkish defences in 1791–92, reported 'nothing which can with propriety be called a fortification'. Admiral Sir William Sidney Smith was similarly critical, while in 1793 the British agent George Monro reported of the Dardanelles 'where they have forts, they are so situated as to be nearly useless, either from the construction or from neglect of what is well constructed'.

In the Balkans, fortresses were also important in successive wars between Austria and Turkey. Having captured Belgrade in 1717, the Austrians then refortified it, with a new *enceinte* (perimeter) of eight substantial bastions. However, defeats in the field and a collapse of confidence led the Austrians to surrender the still unbreached fortress in 1739. Belgrade featured again when the two powers next fought, in 1788–90, being beseiged and stormed by the Austrians in 1789 only to be handed back in the subsequent peace.

Continuing the seventeenth-century pattern, Russian control further east was anchored by lines of forts. For example, the Bashkirs were suppressed to the north-east of the Caspian in the 1720s and 1730s. Russian control was anchored by a new line of forts from the River Volga to Orenburg. Other lines of forts further east consolidated Russia's advancing frontiers, defying the Kalmyks and the Dsungars. The southward advances of these fortifications closed the way for nomadic invasions, sealed off regions from hostile reinforcement and prepared for subsequent successful Russian advances into Kazakhstan and Central Asia. Fortresses built on the River Irtysh included Omsk (1716) and Ust'-Kamenogorsk (1719).



PLAN OF PONDICHERRY, INDIA, BY JACQUES BELLIN, 1741 The capital of French India, the city was defended against both attack by local Indian powers and by the British. In 1748, a British siege was unsuccessful. Operations were delayed by preparations and by the capture of an outlying position, and the siege was abandoned after an ineffective bombardment and heavy losses to defeat. However, the British captured Pondicherry in 1761, 1778, 1793, 1803, returning it under the peace treaties of 1763, 1783, 1802, 1814 and 1815, albeit with the fortifications slighted. In 1778, the British siege battery included 28 heavy cannon and 27 mortars.

In his *Decline and Fall of the Roman Empire*, published between 1776 and 1788, Edward Gibbon presented such fortifications as a vital aid to European civilisation:

'Mathematics, chemistry, mechanics, architecture, have been applied to the service of war; and the adverse parties oppose to each other the most elaborate modes of attack and of defence. Historians may indignantly observe that the preparations of a siege would found and maintain a flourishing colony; yet we cannot be displeased that the subversion of a city should be a work of cost and difficulty, or that an industrious people should be protected by those arts, which survive and supply the decay of military virtue. Cannon and fortifications now form an impregnable barrier against the Tartar horse; and Europe is secure from any future irruption by Barbarians.'

CHINESE ADVANCES

The same could be applied to Chinese advances into Central Asia, notably Mongolia, Xinkiang and Tibet. Fortresses were built, especially in Xinkiang, to protect centres of government and communication routes. Chinese fortification techniques, however, were different to those of the Europeans. The Chinese built with earth. These earth forts, which were certainly fit for purpose in this period, were to be surprisingly effective against British warships in the nineteenth century. In China's cities, the élite banner units were based in segregated walled compounds.

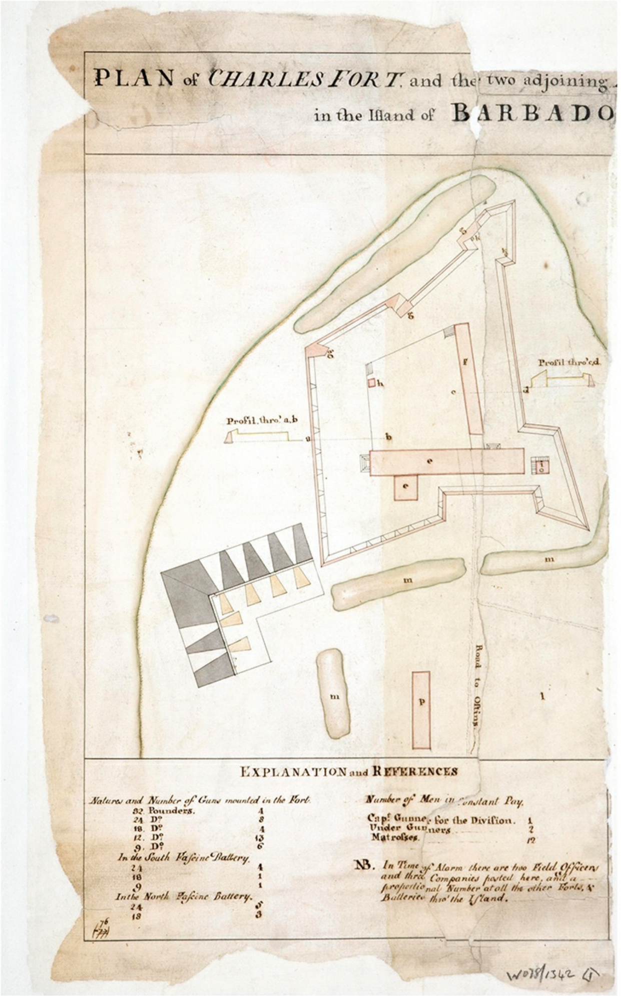
Fortifications could also be used by China's opponents, most prominently by the Tibetan minority of western Sichuan, who were known as the Gyalrong or Golden Stream tribes and have also been called Jinchuan. They used strong, well-sited stone fortresses and it proved very costly and time-consuming for the Chinese to take the towers, while bypassing them led to a vulnerability to attacks on Chinese supply lines. The 1747–49 war ended inconclusively despite major Chinese efforts. In the second war, that of 1771–76, the Chinese were again hindered by the numerous stone towers of their opponents, which were now strengthened against Chinese cannon by the use of logs and packed earth. Capturing the towers, in which the Chinese used cannon, took major efforts, but was finally successful.

In order to control the area, the Chinese then established fortresses of their own, in the shape of military colonies staffed with Chinese troops. This was a technique they used on both external and internal frontiers, for example in Xinkiang against the Dsungars and at Hami. It was a long-standing technique in Chinese history; just as it had been used by the Romans.

PERSIAN EMPHASIS ON BATTLE

In Persia (Iran), the emphasis was on battle, not siege, which often proved difficult. Strong in cavalry, not infantry, the Safavid (Persian) army sent to suppress an Afghan rebellion mounted an unsuccessful siege of Kandahar in 1711, and was heavily defeated as it retreated. In 1721, an Afghan army besieged Kirman in eastern Persia, but failed to take the citadel. In contrast, in 1722, advancing into central Persia, the Afghans, after defeating a far larger Persian army at Gulnabad, blockaded the capital, Isfahan, defeating attempts at relief, but lacking the numbers to storm the city and the artillery to breach its walls. Famine in the city caused by a seven-month siege finally led to its surrender, as it had done at Rome in 410 and Kenilworth in 1266.

In turn, Nadir Shah, who made himself Shah of Persia in 1736, captured Kandahar in 1738 after a nine-month siege, in large part due to help from within the city. Nadir, however, preferred battles to sieges because the latter posed a major logistical challenge, and it would be difficult to maintain the cohesion and morale of a besieging army composed in large part of tribal levies. Moreover, on a pattern long familiar with highly mobile forces, his lack of adequate siege artillery left risky, wasteful assaults or lengthy blockades as the only alternatives when attacking fortified positions. Blockade meant delay and demanded patience, which did not suit his personality. In advance of his cannon, Nadir arrived at Ottoman-held Kirkuk in 1743 and was unable capture the town, but, once cannon finally arrived, a day's bombardment led to the surrender of the fortress.


PLAN of CHARLES FORT and the two adjoining
in the Iſland of BARBADO
Profil thro' a.b
Profil thro' c.d
Road to Oftins
EXPLANATION and REFERENCES
Natures and Number of Guns mounted in the Fort
32 Pounders. 4
24 D° 8
18 D° 4
12 D° 13
9 D° 6
In the South Faſcine Battery.
24 4
18 1
9 1
In the North Faſcine Battery.
24 5
18 3
Number of Men in Constant Pay.
Capt Gunner for the Diviſion. 1
Under Gunners 2
Matroſses. 12
NB. In Time of Alarm there are two Field Officers and three Companies posted here, and a proportional Number at all the other Forts, & Batteries thro' the Iſland.
WO78/1342

CHARLES FORT, BARBADOS, 1748 This fort was originally known as Fort Needham when it was constructed at Needham's Point in the 1650s to protect Carlisle Bay. Barbados became an English colony in 1625, and was captured in 1651–52 by a Parliamentary force that overcame the Royalists. It was then necessary to protect the lucrative sugar colony against the Dutch and Spain, with which England fought wars in the 1650s. Subsequently, Barbados also had to be protected from France. Forts were located along the south-western and western coasts, whereas on the eastern and northern coasts, the rough seas, towering cliffs and lack of harbours served as a deterrent. The British retained Barbados in a series of wars. and used it as a base for expeditions, for example that which captured Martinique from France in 1762. The remains of the fort are now in the grounds of a Hilton resort.

INDIAN USE OF FORTRESSES

In India, there were many fortresses, and Maratha hill forts in west India played a major role in resisting Mughal attack in the 1700s. The mobile and decentralized style of Maratha campaigning undermined the logistical basis of their slower-moving opponents' operations. At the same time, alongside logistical considerations, Maratha strategy reflected political and cultural assumptions about place, more particularly the belief that forts were necessary for the symbol and reality of power. Such a feature reflected the wide-ranging context of the decision-making process about fortifications.

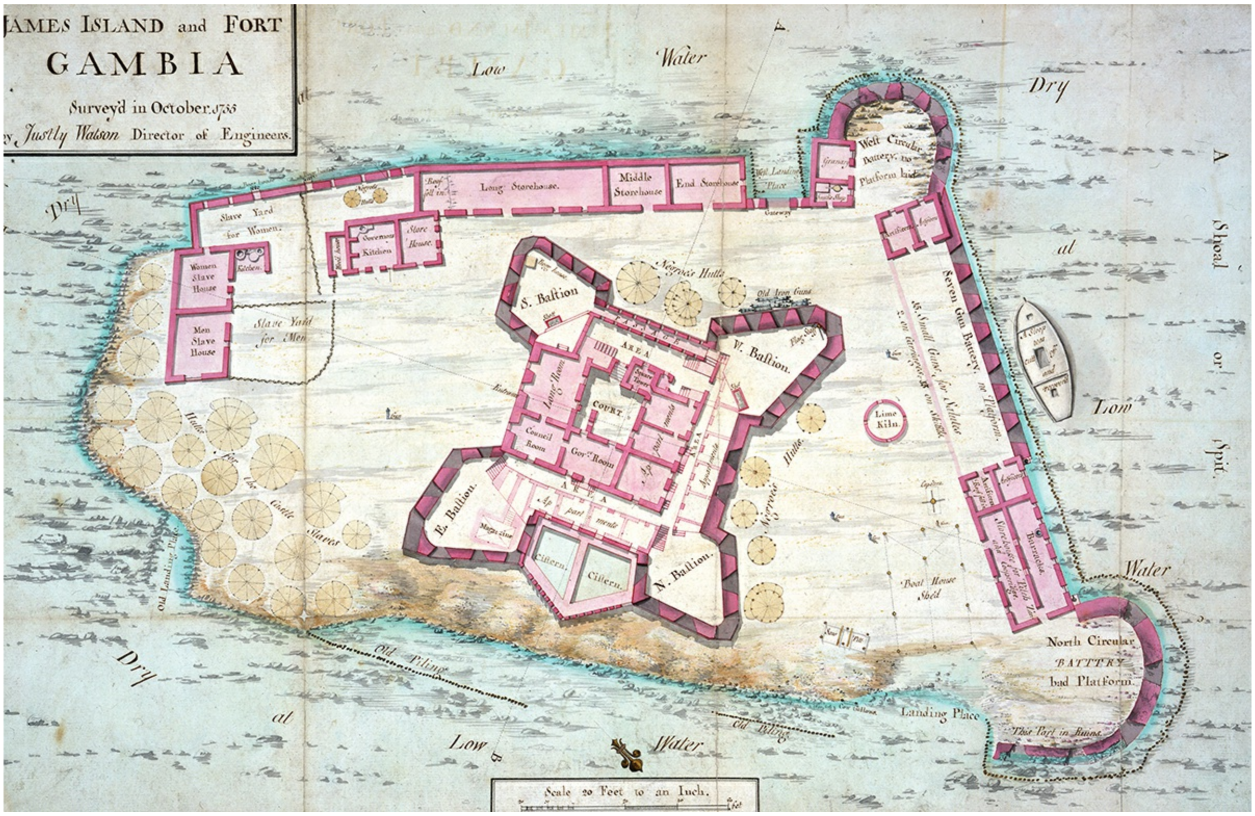
This Maratha belief provided the Mughals with clear targets, for position warfare was different from its manoeuvrist counterpart, which instead favoured the Marathas. In part, Aurangzeb, the Mughal Emperor (r. 1658–1707), was successful against Maratha fortresses thanks to his siege artillery. However, exploiting the weaknesses and divisions of opponents proved more useful, notably the bribery of fortress commanders. Moreover, Maratha field forces were not strong enough to break sieges, which Aurangzeb covered with field armies.

During the eighteenth century, Indian rulers made little effort to strengthen fortifications by means of adding bastions and reducing the height of high stone walls vulnerable to cannon. The standard location for fortresses remained mountains or hills, and the terrain provided a degree of protection not generally seen in Europe. Furthermore, although British officers who had seen service in Europe often remarked how much weaker and more irregular were the numerous mud forts that peppered India, the thick walls of these fortresses for long proved resilient, as when Gheria and Khanderi in 1718 and Colaba in 1721 (forts on the Konkan coast on the Arabian Sea) saw off British naval attacks.

In contrast, Western powers introduced new techniques into India. Major John Corneille noted in 1754 that when Fort St David in the Carnatic was acquired by the British East India Company, it was 'an irregular square fortified according to the Moorish manner, with round towers at the angles', whereas the Company had 'modernised the fortifications with a good bastion at each angle, a hornwork before the gateway, two half-moons in the ditch… and a well-mined glacis'. The Company was fortifying Madras with 'several excellent good bastions, and a broad, deep, wet ditch' and at Trichinopoly had replaced a reliance on high battlements and round towers by adding bastions.

Moreover, European forces became more significant from the 1740s, and the effective artillery they deployed posed a challenge to Indian fortresses.

Irrespective of the strength of the fortification, a bold assault or defence could be a key element, as with Robert Clive's successful defence of the fortress of Arcot in the Carnatic against the much stronger local forces of the local Nawab in 1750. The fortifications of Arcot had been poorly maintained, but Clive held off a siege that included an assault on two breaches. British attacking tactics relied on opening a breach with artillery and then storming the breach, as in 1791, when the British captured the Mysore hill forts of Nundydroog and Sevendroog, both hitherto thought impregnable, and in 1799 when Seringapatam, the Mysore capital, a formidable position on an island in the River Cauvery, was taken. Not all operations were successful, as Lieutenant-Colonel Henry Cosby noted in 1780 when he reported on the consequences of delays in raising ladders: '[B]y this time the enemy's whole force were collected to oppose us, numbers of blue lights hoisted all along the face attacked and rows of pikes presented through every embrasure so that it now became impossible to enter, as a man no sooner got to the top of the ladder than he was knocked down by a shot or a pike.'


JAMES ISLAND and FORT
GAMBIA
Surveyd in October 1755
by Justly Watson Director of Engineers.
Low Water
Dry
A Shoal or Spit.
at
Low
Water
Dry
at
Low Water
Slave Yard for Women.
Kitchen.
Women Slave House
Men Slave House
Slave Yard for Men
Long Storehouse.
Middle Storehouse
End Storehouse
Governours Kitchen
Store House.
West Landing Place
Granary
West Circular Battery, no Platform laid
Gateway
Negroes Hutts
Old Iron Guns
S. Baſtion
W. Baſtion.
Flag Staff
AREA
Square Tower
Long Room
COURT.
Council Room
Govr. Room
Ap part ments
E. Baſtion.
Magazine
Cistern.
Cistern.
N. Baſtion.
Huts for the Castle Slaves
Old Landing Place
Old Piling
Seven Gun Battery, no Platform.
16 Small Guns, for Salutes
Lime Kiln.
Negroes Hutts.
A Sloop
Storehouse for Pitch Tar and Cordage.
Barracks.
Boat House Shed
North Circular BATTERY bad Platform.
Landing Place
This Part in Ruins.
Old Piling
Scale 20 Feet to an Inch.

JAMES FORT, GAMBIA, 1755 This fort on what is now named Kunta Kinteh Island, 21 miles from the mouth of the River Gambia, was captured by the English from the Dutch in 1661. The fort and island were renamed James after James, Duke of York, later James II. France and

Britain contested the island in wars from the 1690s, French forces capturing it in 1695, 1702, 1704, 1708 and 1779, while Howell Davis, a pirate, captured it in 1719, but was killed later that year. The financial problems of the Royal African Company led to control being transferred to the Crown, which had already paid for the maintenance of the Company's forts. The fort protected the British position in the slave trade, and contested the French position in Senegal where the French forts were captured in 1758.

BRITISH FORT BUILDING

The major fortified British positions were naval dockyards or overseas bases, such as Gibraltar and Fort St Philip on Menorca, although the latter was successfully taken by the French in 1756 and 1782, in large part because naval support could not be provided to the defenders.

In contrast, in Britain itself, fortification was largely pressed on in Scotland, to defend against a possible pro-Jacobite rising and/or invasion. As a result, the major defeat of the Jacobites at Culloden in 1746, bringing to a close a rebellion that had threatened the total overthrow of Hanoverian rule in Britain, was followed by pressure for a renewed programme of fortification in Scotland. The victorious general, William, Duke of Cumberland, wrote: 'It will be absolutely necessary that new forts be erected here [Inverness], and where Fort Augustus stood.' His protégé, William, 2nd Earl of Albemarle, followed up by arguing: 'Fort George, Fort Augustus and Fort William should be made strong, defensible, and capable of containing considerable garrisons; the barrack of Inversnaid at the head of Loch Lomond should be made defensible.' A major new fort near Inverness, Fort George, was begun at Ardersier Point in 1749. Costing more than £100,000, it was a state-of-the-art bastioned fortification, which remains impressive to this day. That it did not hear a shot fired in anger is beside the point for the deterrent aspect of fortification is a crucial one.

In contrast, there was no programme of fortification elsewhere in the British Isles. There was no system of citadels protecting major domestic centres of government. Indeed, when the Jacobites invaded England in 1745, they benefited from the weakness or absence of its fortifications. Not only did this ensure that the Jacobites did not have to fight their way through a series of positions, losing time and manpower as they did so, but it also meant that the British army lacked a network of bases that could provide shelter and replenish supplies. After the Jacobites captured poorly fortified Carlisle, Charles Edward Stuart faced no fortified positions on his chosen route to

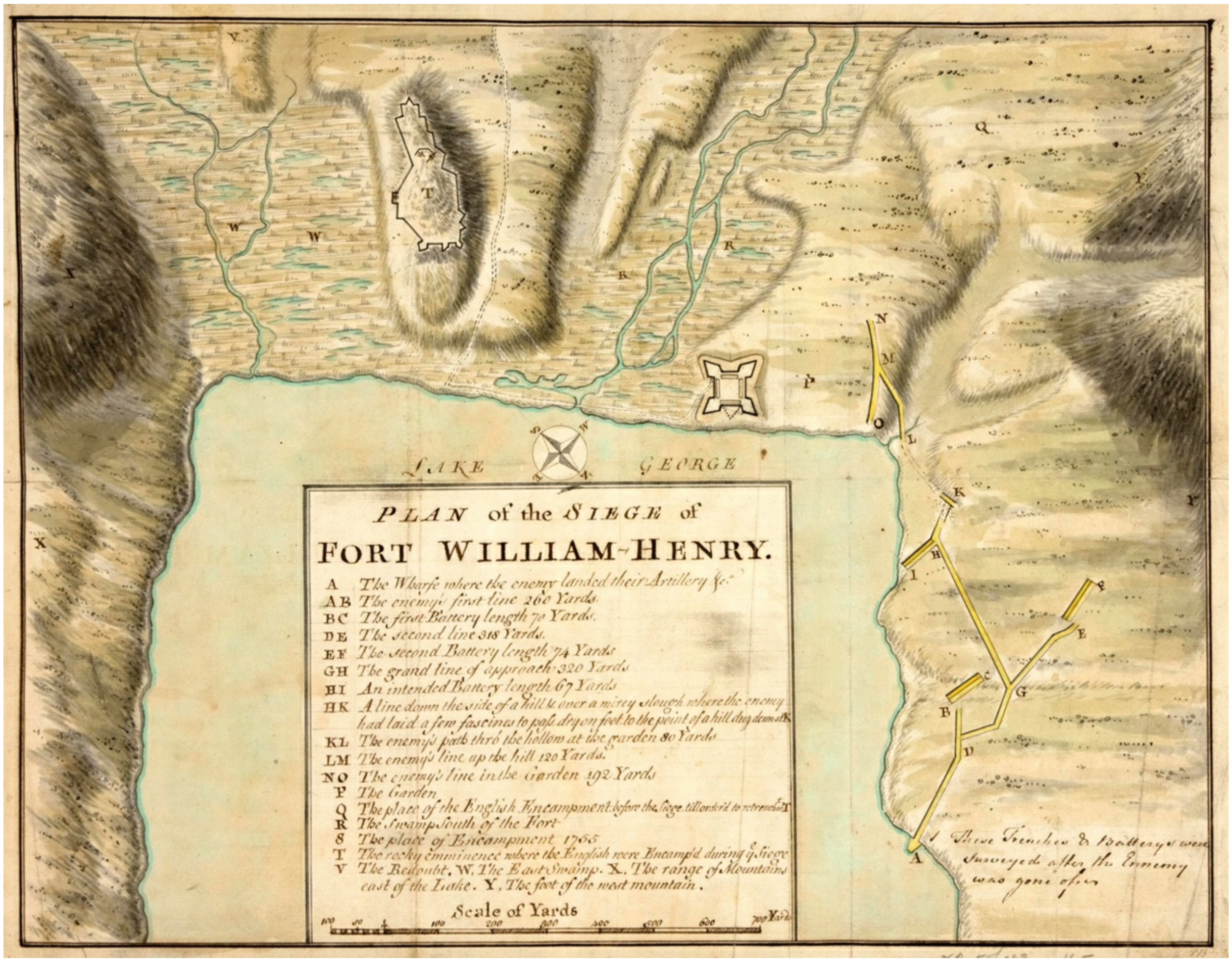
London. Preston, Manchester and Derby fell without resistance.

The same was true of Ireland. Henry Conway, secretary to the Lord-Lieutenant of Ireland, and a Major-General, reported from Dublin in 1756:

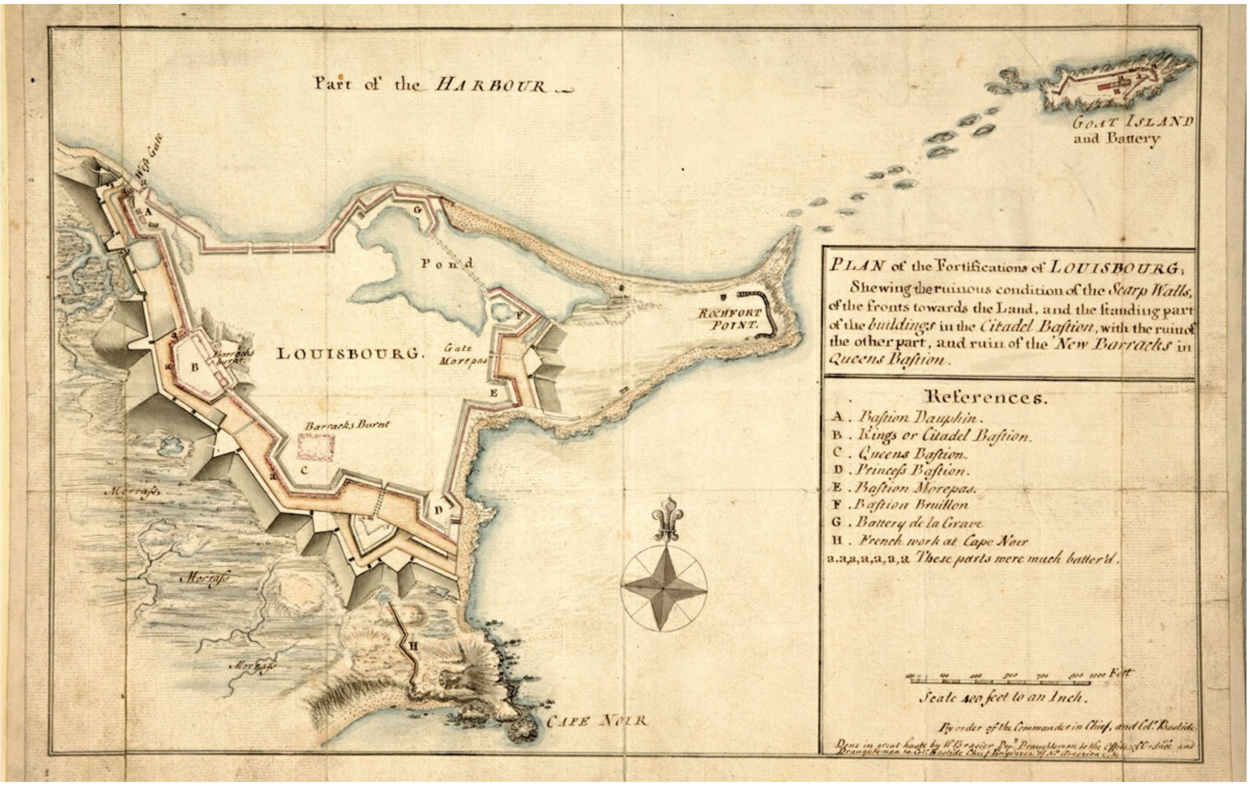
> **[A]mong the places commonly spoke of as garrisons the greatest part are improperly termed so, such as Dublin, Cork, Limerick etc. which not being in any state of defence are not otherwise to be considered as garrisons than as they want some troops to defend any stores, trade, etc that are in them and to keep the Papists [Catholics] in awe, so that the only places which deserve to be thought of as garrisons to be held against an enemy are almost reduced to Charlesfort and Duncannon Fort now repairing.'**

This pattern was more general. On and near the frontiers, new fortifications protected newly won and apparently vulnerable positions, while elsewhere there was a general failure to keep up with the need to maintain fortresses if they were to be fit for purpose other than for maintaining civil order, a failure that was understandable in terms of the costs and garrisoning involved.

Moreover, private individuals in many states increasingly chose to rely on the state to defend them. Indeed, during the 1745–46 Jacobite rebellion, John Campbell, Lord Glenorchy, a supporter of the government and a Scottish landowner, wrote to his daughter: 'I have often repented taking out the iron bars from the windows and sashing them, and taking away a great iron door, and weakening the house as to resistance by adding modern wings to it. If it had remained in the old castle way as it was before, I might have slept very sound in it, for their whole army could not have taken it without cannon.'


LAKE GEORGE
PLAN of the SIEGE of
FORT WILLIAM-HENRY.
A The Wharfe where the enemy landed their Artillery &c.
AB The enemy's first line 260 Yards.
BC The first Battery length 70 Yards.
DE The second line 318 Yards.
EF The second Battery length 74 Yards
GH The grand line of approach 320 Yards
HI An intended Battery length 67 Yards
HK A line down the side of a hill & over a mirey slough where the enemy had laid a few fascines to pass dry on foot to the point of a hill dug down at K
KL The enemy's path thro' the hollow at the garden 80 Yards
LM The enemy's line up the hill 120 Yards.
NO The enemy's line in the Garden 192 Yards
P The Garden
Q The place of the English Encampment before the Siege till order'd to retrench at T
R The Swamp South of the Fort
S The place of Encampment 1755
T The rocky emminence where the English were Encamp'd during ye Siege
V The Redoubt. W. The East Swamp. X. The range of Mountains east of the Lake. Y. The foot of the west mountain.
Scale of Yards
100 50 0 100 200 300 400 500 600 700 Yards
These Trenches & Batterys were surveyed after the Enemy was gone off
A B C D E F G H I K L M N O P Q R S T V W X Y

SIEGE OF FORT WILLIAM HENRY, NORTH AMERICA, 1757 A British fort at the southern end of Lake George in the province of New York, it was built in 1755 in order to provide a forward base against French-held Canada on the Lake Champlain-Hudson Valley corridor. Built as an irregular square fortification with corner bastions, it was surrounded by a dry moat apart from on the lakeside. On 3 August, a much larger French force under Louis-Joseph de Montcalm arrived. Siegeworks were the basis for a strong bombardment by 30 cannon Montcalm had dragged overland and, with no hope of relief, the garrison surrendered on 6 August. Around 200 of the surrendered force were murdered by Montcalm's Native American allies in violation of the terms of surrender. After the battle, the French destroyed the fort. A replica was built in the 1950s.


Part of the HARBOUR
GOAT ISLAND and Battery
Pond
LOUISBOURG.
Gate Morepas
Barracks Burnt
ROCHFORT POINT.
Morass
CAPE NOIR
PLAN of the Fortifications of LOUISBOURG, Shewing the ruinous condition of the Scarp Walls, of the fronts towards the Land, and the standing part of the buildings in the Citadel Bastion, with the ruin of the other part, and ruin of the New Barracks in Queens Bastion.
References.
A. Bastion Dauphin.
B. Kings or Citadel Bastion.
C. Queens Bastion.
D. Princess Bastion.
E. Bastion Morepas.
F. Bastion Bruillon
G. Battery de la Grave
H. French work at Cape Noir
a,a,a,a,a,a,a These parts were much batter'd.
Scale 400 feet to an Inch.
By order of the Commander in Chief, and Col. Bastide

DEFENCES OF LOUISBOURG, CANADA, 1758 The major French fortified position in maritime North America, Louisbourg was designed to guard the eastern approaches to New France (Canada). However, the fortress was vulnerable to attack on its landward defences, on which the British concentrated in their successful campaigns of 1745 and 1758. Louisbourg also suffered from the difficulty of providing relief. French hopes in 1758 that disease would see off the assault proved misplaced. The British deployed a large fleet and 14,000 troops. The siege and bombardment, in which (unlike the defenders) the army and navy co-operated, not least with the provision of sailors to haul the cannon and dig trenches, were effective. British cannon breached the walls, while British warships penetrated the harbour. The French lost five warships and 3,000 troops surrendered. After the surrender, the British successfully attacked Québec in 1759 while also destroying the fortifications at Louisbourg.

However, in 1762, which was internally more peaceful, and with the French fleet heavily defeated three years earlier, Elizabeth Montagu, a prominent social commentator, could reflect: '[A] virtuoso or a dilettante may stand as secure in these times behind his Chinese rail as the knight on his battlements in former days.' The establishment of militia forces to supplement regular armies further encouraged a move away from fortification for domestic security as, later in the nineteenth century, did the development of police forces. Indeed, castellated features very much became an architectural device that lacked any fortification feature, as, for example, in the nineteenth century with Neuschwanstein in Germany and Cragside in Britain and in the twentieth century with Hearst Castle in California.

CONSIDERATIONS AND CONSTRAINTS

Fitness for purpose was a key concept and helped direct and reflect a variety in specifications and tasks. Equations of defensive strength and offensive firepower were important in determining the potency of fortifications and the success of sieges, although they should not lead to the discounting of leadership, unit cohesion and fighting quality. Rather than assuming a perfect state of fortification, it is necessary to evaluate systems, not only with reference to the specifications that led to these equations, but also within the constraints of manpower and cost and notably as understood in terms of military strategy and political priorities. This returns attention from the theoretical and systemic to the particular and, specifically, to the political character of decision-making. The latter could focus on the benefits that might stem if resources were employed differently.

Most obviously, apart from the cost of construction, fortifications required large garrisons and numerous cannon that could not readily be used for other purposes. Those near Susa, designed to protect Piedmont from French invasion along the valley of the Dora Riparia, were estimated in 1764 to require a garrison of near 4,000 troops. Such forces could act as an operational reserve, but, more commonly, garrison forces lacked mobility, flexibility and, as a result of a shortage of training and a process of ossification, could even lack combat effectiveness, at least for offensive operations. These forces tended to be made up from second-rank units and often older soldiers.

Forts continued to play a major role in the last quarter of the century. The War of American Independence (1775–83) is not generally seen in terms of fortifications, and many fortified positions fell rapidly. The British rapidly captured Fort Washington (1776), Savannah (1778) and, more particularly, despite its large garrison, Charleston (1780). The subsequent discussion of the war in the United States did not focus on fortifications or on sieges, apart from the successful Franco-American siege of the British force entrenched at Yorktown in 1781.

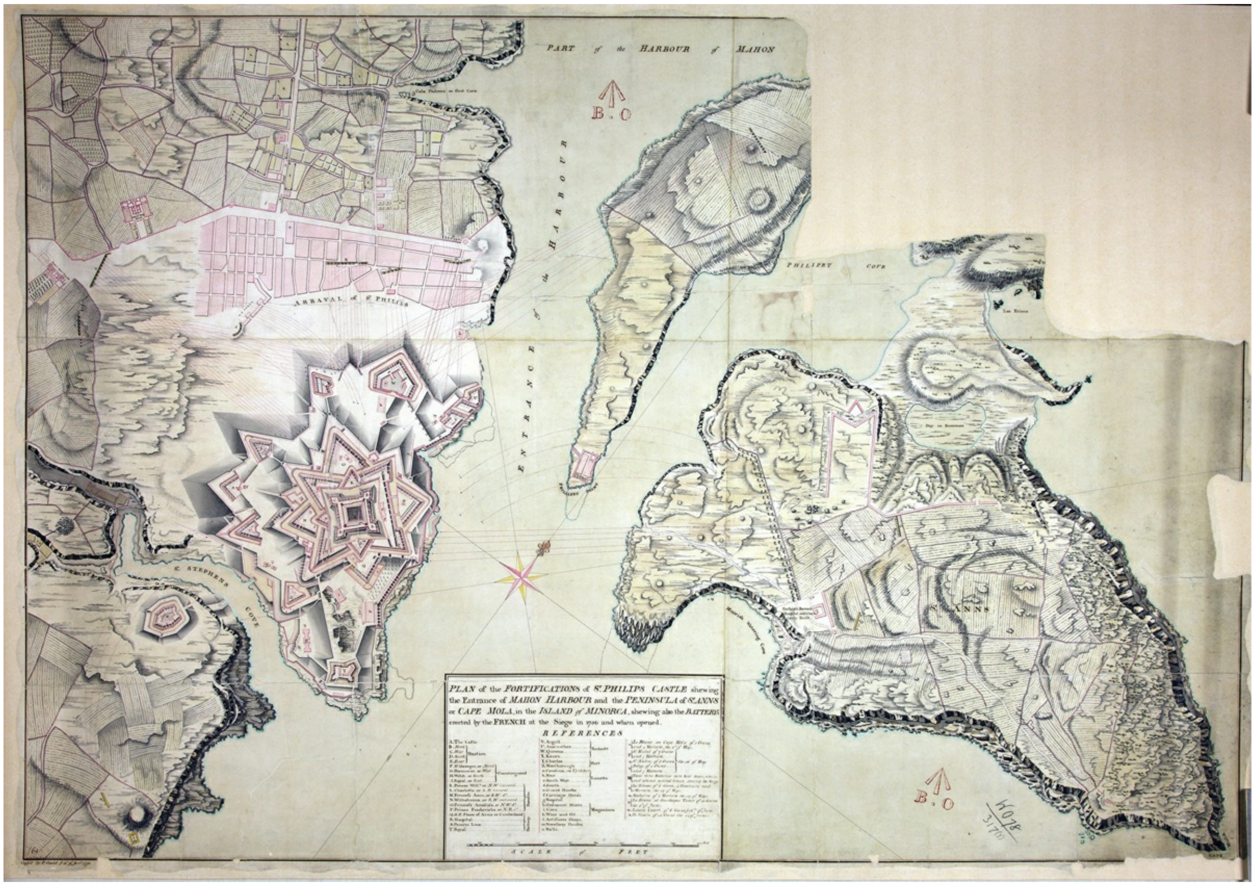
However, fortifications were important at tactical, operational and strategic levels. For example, Fort Sullivan, on a sandspit that protected Charleston harbour, was attacked by British warships in 1776, but its thick earth walls, faced with palmetto logs, were not badly damaged by the British cannonballs, while the warships suffered heavily from the well-aimed cannon in the fort. The British failure was very important to the consolidation of the revolution in the South, although the British were to be able to try again and capture Charleston in 1780 after a brief siege. In contrast, the American inability, by both siege and storm, to take well-defended Québec in the winter of 1775–76 was decisive in the failure of the attempt to conquer Canada. The British abandoned Boston in March 1776, once American cannon threatened its anchorage, which demonstrated the reliance of fortified positions on their communications and supplies. However, the Americans failed to repeat this success against New York, Savannah or Charleston once they had been captured by the British in 1776, 1778 and 1780 respectively, despite a Franco-American siege of Savannah in 1778, a siege that resolved itself into a badly organised and unsuccessful assault. As a result of Britain retaining these positions, the war ended with both sides obliged to negotiate terms.

Fortresses and sieges remained significant in the 1780s. Austrian success in thwarting Prussia in advances in the War of the Bavarian Succession (1778–79), in part by the use of field fortifications to enhance naturally strong positions, was followed by a post-war Austrian fortification strategy designed to block possible Prussian invasion routes into Bohemia, particularly at Theresienstadt (later a concentration camp) and Josefstadt, which were built to complement the pre-war construction of Königgrätz. The victorious Prussian intervention in the Dutch Crisis of 1787 ultimately rested on a successful and speedy siege of Amsterdam. At a very different scale, Russian victory over the Turks in the war of 1787–92 similarly rested on victorious sieges, notably of Ochakov, which became the centre of an international crisis in 1791.

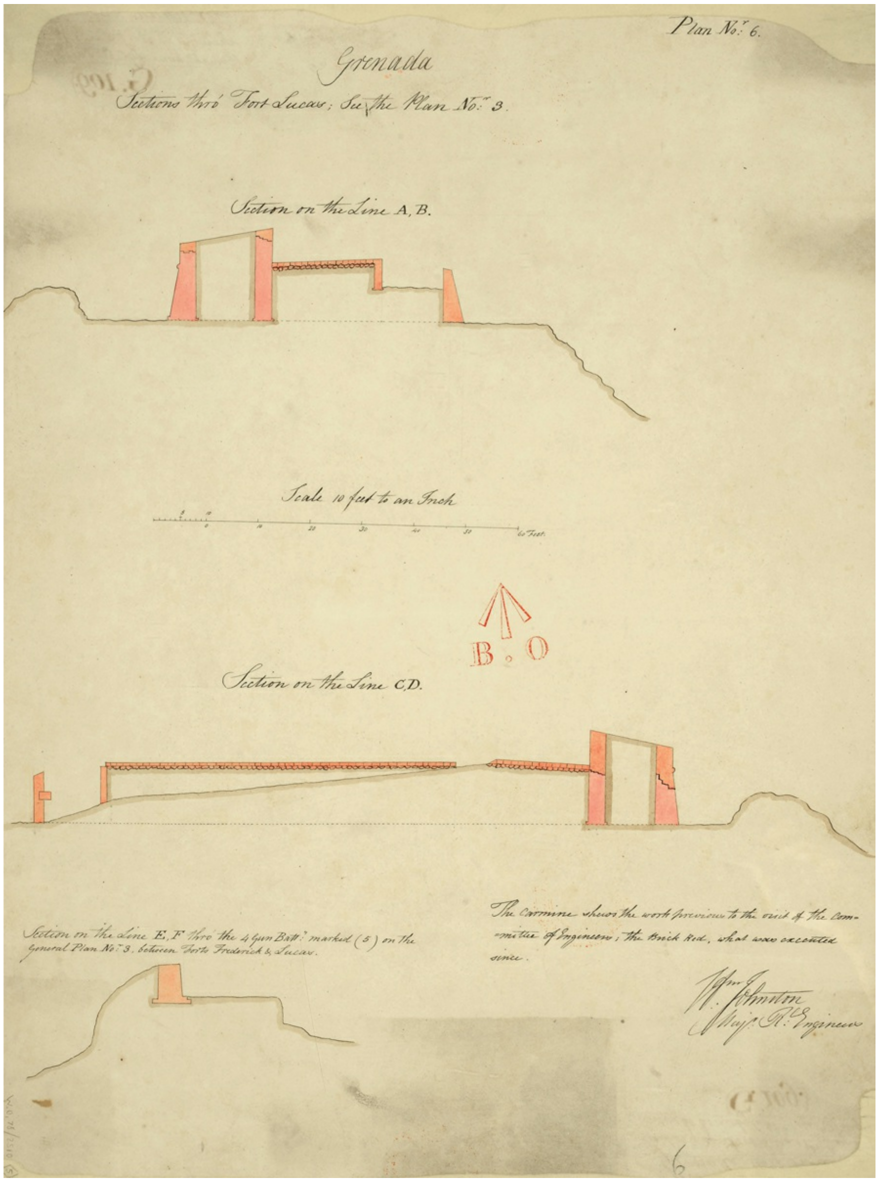
CONTINUED SIGNIFICANCE OF FORTIFICATION

The eighteenth century is commonly presented by military historians in terms of a move from a somewhat static, limited warfare of positional operations under the *ancien régime* to a more vigorous style of campaigning under revolutionaries who pursued total warfare. Sieges are generally located in terms of the former and suffer, accordingly, from the pejorative assumptions of indecisiveness and anachronism that are frequently asserted.

This approach is seriously flawed. It does not capture the energy, determination and, often, savagery involved in much siege warfare, for example the successful assaults on the Schellenberg (1704), Bergen-op-Zoom (1747), and Ochakov (1788), by the British, French and Russians respectively, or the decisive strategic and political consequences that might stem from success or failure in sieges. More than 5,000 of the 22,000 Allied troops involved in the eventually successful attack on the Schellenberg were casualties, including ten generals among the dead. The Franco-Bavarian defenders also lost heavily, one recording 'my coat was covered with brains and blood'. The narrative and analysis of change mentioned above also has little meaning for non-Western societies. Thus, rather than locating and minimising the role of fortifications in a flawed general theory of military developments, it is more appropriate to note their continued military significance and the degree to which this was readily apparent to contemporaries. Fortification was a standard form of military practice and a major aspect of military expenditure. It is not surprising that sieges were so important.


PART of the HARBOUR of MAHON
B.O
ENTRANCE of the HARBOUR
PHILIPET COVE
ARRAVAL of St PHILIPS
St STEPHENS COVE
St ANNS
PLAN of the FORTIFICATIONS of St PHILIPS CASTLE shewing the Entrance of MAHON HARBOUR and the PENINSULA of St ANNS or CAPE MOLA, in the ISLAND of MINORCA, shewing also the BATTERIES erected by the FRENCH at the Siege in 1756 and when opened.
REFERENCES
SCALE of FEET
B.O

MINORCA, SPAIN, 1772 Captured by the British in 1708, Minorca was invaded by French forces under the Duke of Richelieu in 1756. They successfully besieged the main British position, Fort St Philip, a fortress designed and built in the 1550s by the Italian engineer Giovanni Battista Calvi. The fort commanded the entrance to a deep-water anchorage that was far more sheltered than that at Gibraltar and this provided the British with a base for blockading the French Mediterranean fleet in Toulon. The fort was strengthened after it was regained by the British under the peace of 1763. The map depicts the main fort and the outlying fortlets, Fort Marlborough on the other side of St Stephen's Cove and Fort San Carlos. A British defender noted 'an order not to fire the same gun above once an hour, there being many bad guns'. This postwar British map shows the batteries used by the French. Minorca was lost again in 1782.

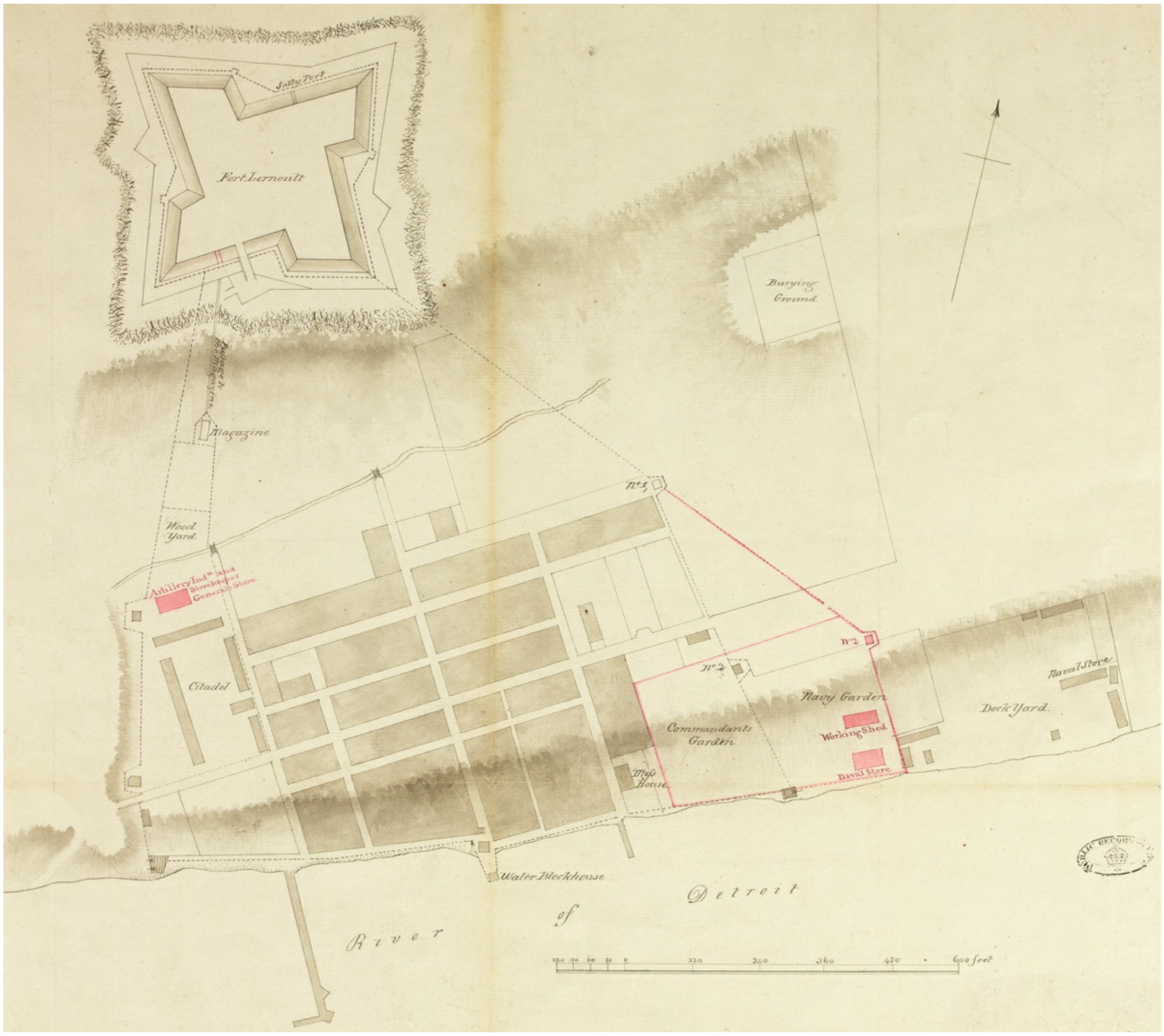

Plan No.r 6.
Grenada
Sections thro' Fort Lucas; See the Plan No.r 3.
Section on the Line A, B.
Scale 10 feet to an Inch
60 Feet.
B O
Section on the Line C, D.
Section on the Line E, F thro' the 4 Gun Batt.y marked (5) on the General Plan No.r 3, between Forts Frederick & Lucas.
The Carmine shews the work previous to the visit of the Committee of Engineers; the Brick Red, what was executed since.
Wm. Johnston
Maj.r R.l Engineers
6

GRENADA A major sugar colony settled by France in 1650, Grenada fell to the British in 1762 and was ceded to them under the Peace of Paris of 1763, only to be regained by France in 1779 as part of an offensive in which France also captured Dominica (1778), St Vincent (1779), Tobago (1781) and Nevis, St Kitts and Montserrat (1782), although Britain regained Grenada in the 1783 peace. In 1795–96, a slave rebellion in which settlers were killed challenged British control, only to be crushed.

The original French fort, Fort Royal, was designed by François Blondel in 1666 and built in 1667. It was renamed Fort George in honour of George III after it was captured by the British in 1762. The fort had a commanding view over the leading port. It was improved in the early eighteenth century in accordance with a new design by Jean de Giou de Caylus, becoming an effective Vauban-style masonry bastion.

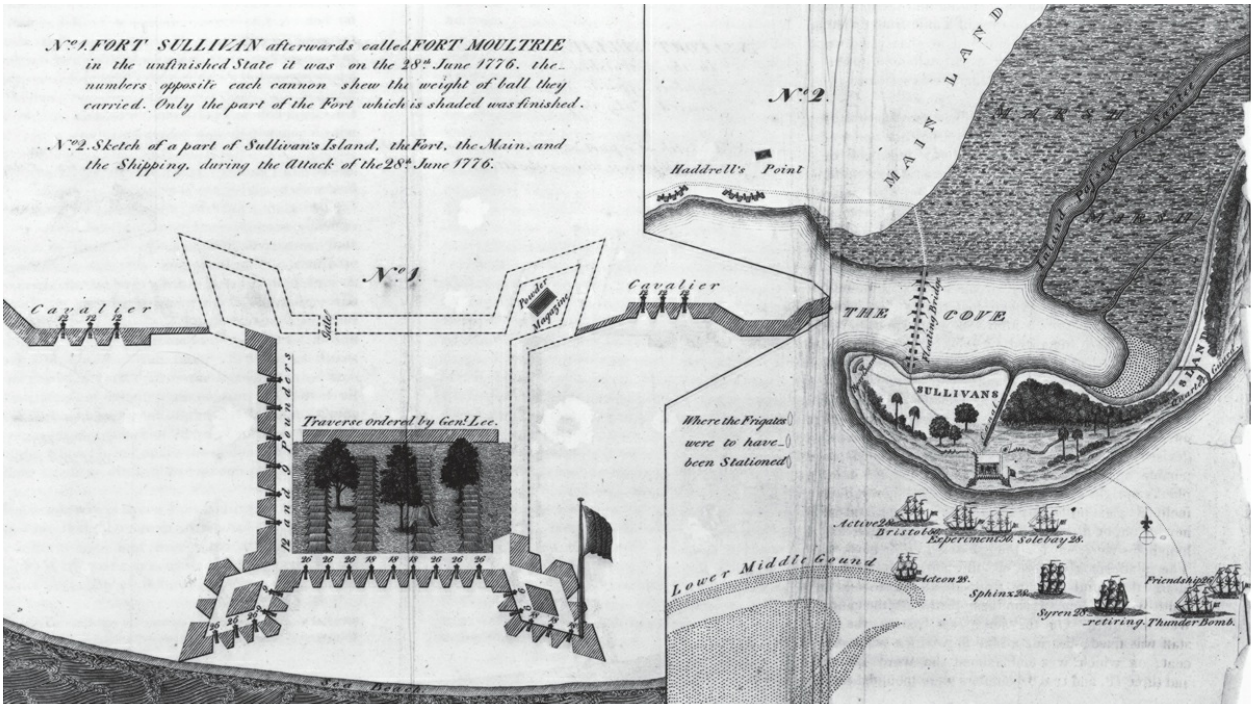
Begun in 1778, Fort Matthew was the largest on the island, and named after Governor Edward Matthew.

Built by the French, with defences against landward attack, Fort Frederick, a bastion-type fort with sensational views, was used by the British in their defence against the French. The fort was bombed by the Americans in 1983 when they successfully invaded the island with overwhelming force.

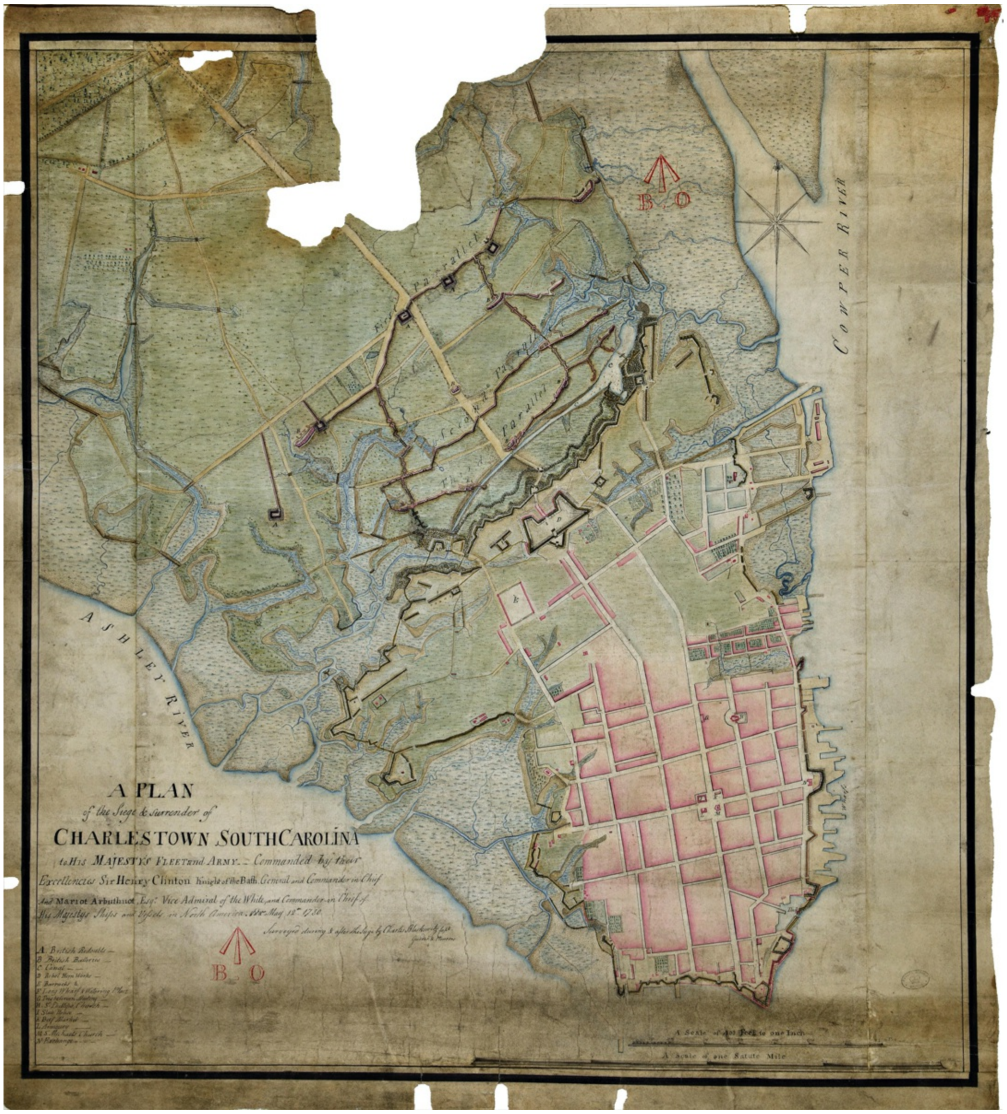

Sally Port
Fort Lernoult
Burying Ground
Magazine
Wood Yard
Artillery Indⁿ and Storekeeper General's Store
Nº 1
Citadel
Nº 2
Nº 2
Navy Garden
Commandants Garden
Working Shed
Naval Store
Mess House
Naval Store
Dock Yard
Water Blockhouse
River of Detroit
0 120 240 360 480 600 feet

PLAN OF DETROIT, NORTH AMERICA France built forts west of the St Lawrence in the early eighteenth century, notably Michilimackinac (1700), Detroit (1701) and Niagara (1720). These fortresses altered the strategic situation. They narrowed the frontiers, required regular garrisons and offered targets, for a fort taken was far worse than no fort at all. The best forts required attack by units supported by cannon, implying larger, if not regular, forces, roads and improved logistics.

Surrendered to the British in 1760 during the Seven Years War and formally acquired by them under the Peace of Paris (1763), Fort Pontchartrain, the fort at Detroit, faced a siege during the Native American uprising known as Pontiac's War. Begun on 7 May 1763, the unsuccessful siege was lifted on 31 October. In 1778, the Americans planned an expedition to capture Detroit in order to blunt the threat of British–Native American co-operation, but it was abandoned due to a lack of resources and the distance to the target. In 1778–79, the British improved the fortifications, adding Fort Lernoult on a commanding hill to the north of the original fort. Major Richard Lernoult oversaw the construction of a 400 square foot structure ringed by a palisade fence with earth walls between 12 feet and 26 feet thick. The British evacuated Detroit in 1796 after Jay's Treaty (1794). The Americans renamed the fort Fort Detroit, but in 1812 the poorly commanded garrison surrendered to a smaller British-Native American force when it lost its nerve as a result of failures nearby in the early stages of the War of 1812. Detroit was regained by the Americans in September 1813, when they won an important naval battle on Lake Erie and the British abandoned the position. Fort Lernoult, later called Fort Shelby, was evacuated in 1826 and demolished in 1827.

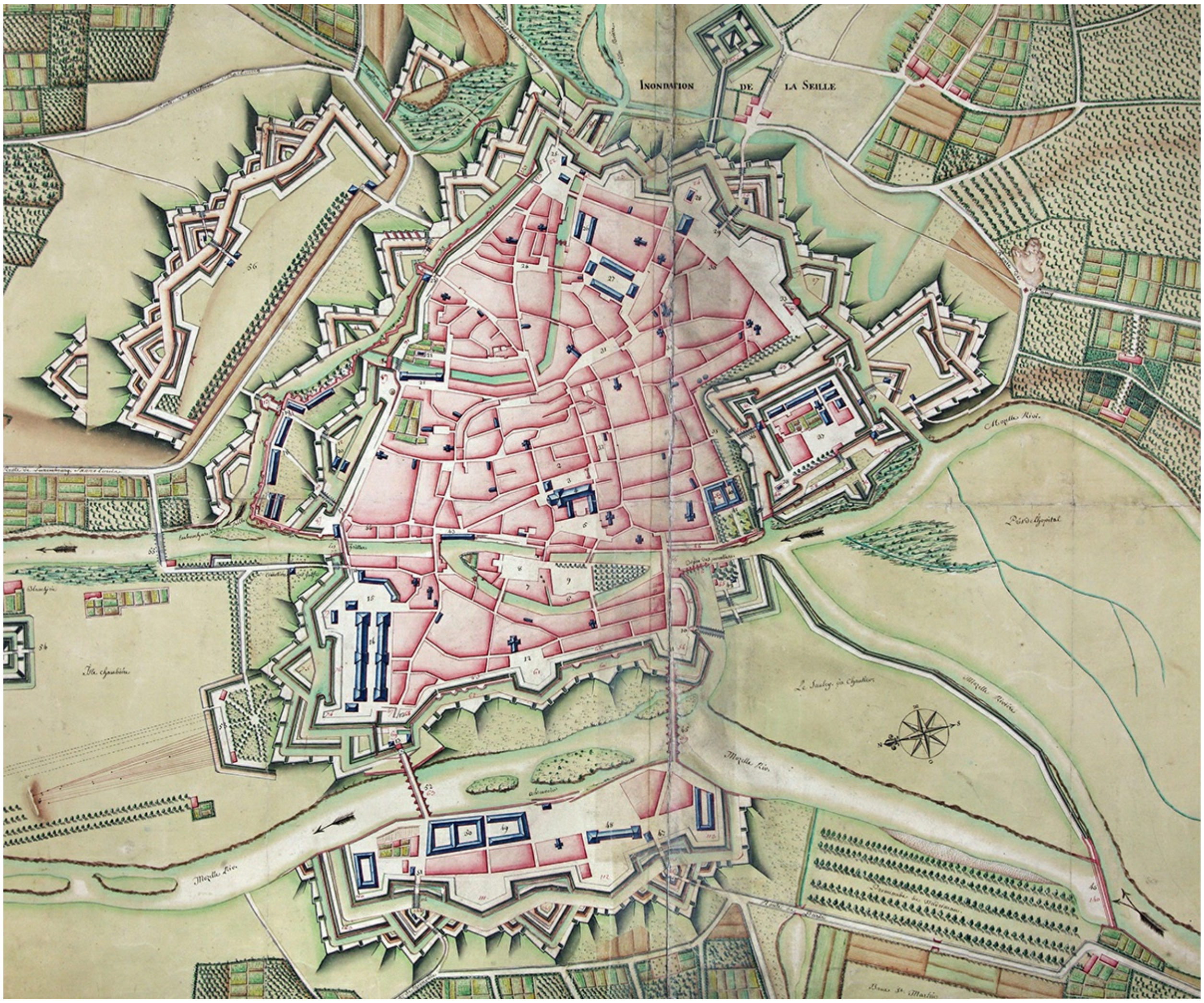

Nº1. FORT SULLIVAN afterwards called FORT MOULTRIE in the unfinished State it was on the 28th June 1776. the numbers opposite each cannon shew the weight of ball they carried. Only the part of the Fort which is shaded was finished.
Nº2. Sketch of a part of Sullivan's Island, the Fort, the Main, and the Shipping, during the Attack of the 28th June 1776.
Nº1.
Nº2.
Cavalier
Cavalier
Powder Magazine
Traverse ordered by Genl. Lee.
9 pounders
Haddrell's Point
MAIN LAND
MARSH
THE COVE
Floating Bridge
SULLIVANS
Canal
Where the Frigates were to have been Stationed
Active 28
Bristol 50
Experiment 50.
Solebay 28.
Lower Middle Gound
Acteon 28.
Sphinx 28.
Syren 28.
retiring.
Friendship 26
Thunder Bomb.
Sea Beach

FORT SULLIVAN, NORTH AMERICA On 28 June 1776, British warships sought to destroy the unfinished fort on Sullivan's Island, a sandspit that protected the harbour of Charleston. However, three ships ran aground. The fort, commanded by Colonel William Moultrie, was not subdued. Its thick earth walls, faced with palmetto logs, were not badly damaged by the British cannonballs, but the warships suffered heavily from the well-aimed cannon in the fort.


A PLAN
of the Siege & surrender of
CHARLESTOWN SOUTH CAROLINA
to His MAJESTY'S FLEET and ARMY. – Commanded by their
Excellencies Sir Henry Clinton Knight of the Bath, General and Commander in Chief
And Mariot Arbuthnot, Esqr. Vice Admiral of the White, and Commander in Chief of
His Majestys Ships and Vessels in North America. May 12th 1780
ASHLEY RIVER
COOPER RIVER
B.O
A. British Redoubts
B. British Batteries
C. Canal
E. Barracks
F. Long Wharf & Watering Place
H. St. Phillips Church
K. Beef Market
L. Armoury
M. S. Michaels Church
N. Exchange
A Scale of one Statute Mile

CHARLESTON, NORTH AMERICA, 1780 There was considerable political pressure among the Americans to hold Charleston, the major city in the Southern states. However, after failing to capture it in 1776 and 1779, the British drew the net round the poorly fortified position in 1780 and on 1 April began digging siege entrenchments. On 8 April, British warships forced their way past American fortifications on the north side of the harbour, a Hessan recording, 'We could see nothing of the ships except the flashes of their guns because of the smoke'. On 13 April, the British siege guns began firing. Under increasingly heavy bombardment that included hot shot designed to cause fires, morale and resolve in Charleston crumbled. General Benjamin Lincoln's offer on 21 April to surrender the town as long as the army was allowed to march away was rejected, as were the terms offered on 8 May. By now the population, their wooden homes aflame, was in favour of peace on any terms, while the British siegeworks were close. On 12 May, the American force, about 5,500 strong, surrendered, as did their navy, which had been employed in static defence. Thereafter, the

British retained the position until they evacuated Charleston on 18 December 1782 as part of the peace with the Americans.



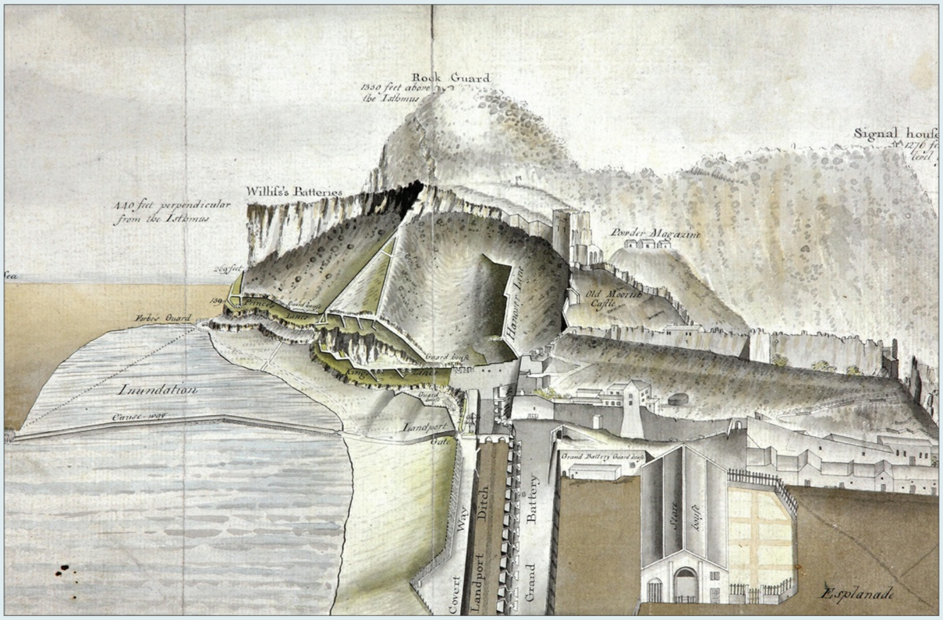
METZ, FRANCE This major French city was fortified by Vauban and later by Louis de Cormontaigne (1696–1752), who became chief engineer at Metz in 1733 and added extensive double crownworks. Metz was fortified anew in the mid-nineteenth century, only to be captured by the Germans in the Franco-Prussian War. These maps show the major improvements under Vauban and Cormontaigne. The latter was particularly active because Metz was a centre of activity for the bellicose Marshal Belle-Isle, who was a very active governor there from 1736 to 1761.

RUINS OF FORTIFICATIONS IN AHMEDABAD, INDIA The capital of Gujarat was established here in 1411. The rapid breaching of the walls of Ahmedabad, a Maratha stronghold in western India, demonstrated the effectiveness of British artillery and led to its fall on 15 February 1780. The British under General Thomas Goddard had arrived on 10 February, and on the 12th established a battery for three 19-pounders and two howitzers within 350 yards of the wall. The defenders 'attempted to disturb the workmen with some small pieces of artillery from towers on the walls, but these were soon silenced by 2 long six-pounders sent down with the covering party'. By the evening of 13 May, the cannon had battered a breach 100 yards wide 'besides the defences taken off for a considerable distance to the right and left'; by the evening of the 14th, a level breach 150 yards wide had been made. The fortress was stormed at dawn on the 15th, the defenders being taken by surprise. Many 'behaved nobly, drawing their swords and dealing blows around them even after the bayonets were plunged in their bodies'.

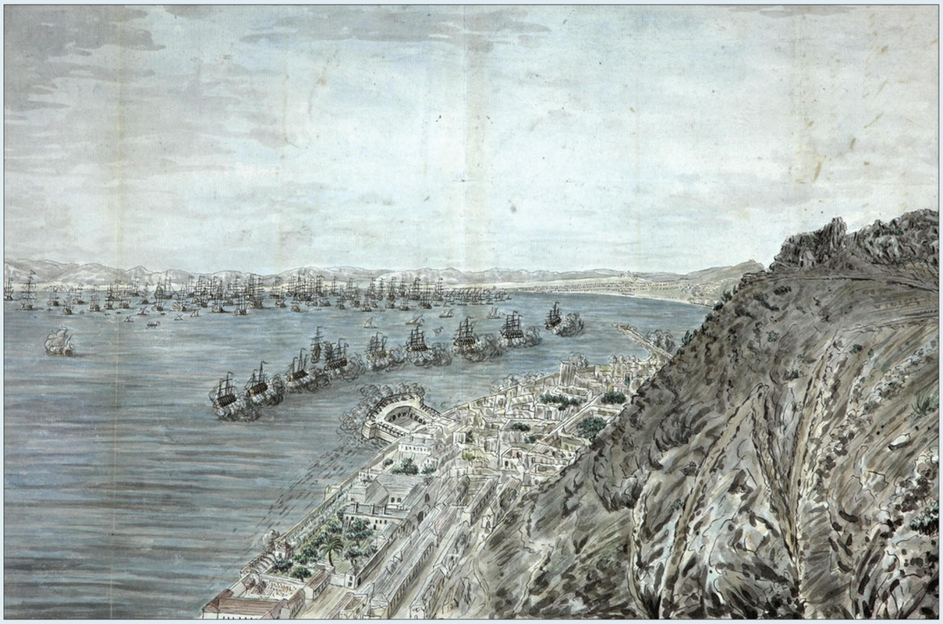
GIBRALTAR, 1782

Gibraltar was a key defensive position. Captured by the British in 1704, the British saw off sieges in 1704–05 and 1727, before resisting a major Spanish attempt during the War of American Independence, which Spain entered in 1779. The blockade began in 1779 and a formal siege in the summer of 1781. On 13 September 1782, a major attack was made with floating batteries, but most were sunk by British fire and, thereafter, the siege became a less intense blockade and bombardment. The British ability to relieve the position by sea was crucial, although it depleted naval strength elsewhere.

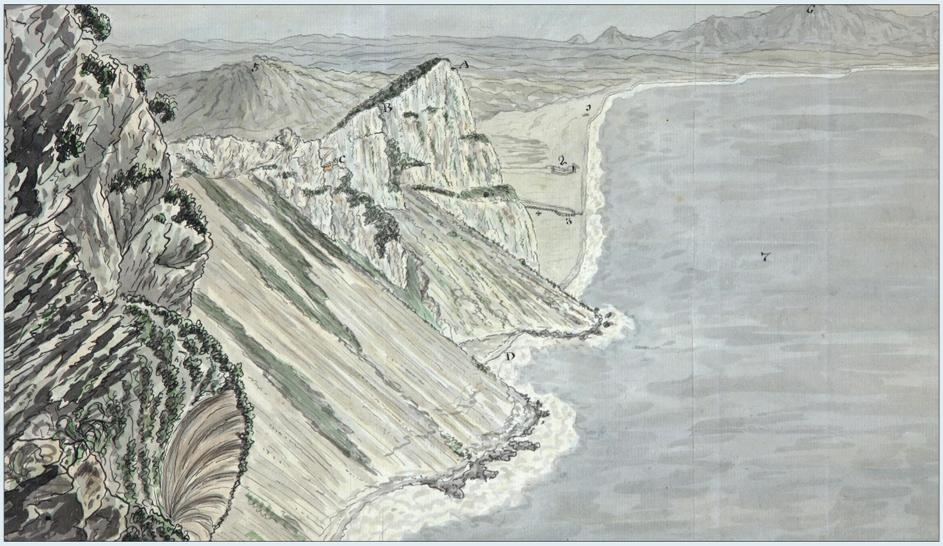
Gibraltar was extensively mapped by British engineers, for example James Montresor between 1747 and 1753, and for the public, notably by Herman Moll in 1727. *A Plan of the Town and Fortifications of Gibraltar with the Spanish Lines and Attacks*, published in London in 1782, included, as scene setters, maps of the Strait of Gibraltar and the Bay of Gibraltar. The main map illustrated the design of these batteries, including with a cut-away view, and showed their position.


Rock Guard
1350 feet above the Isthmus
Signal house
1276 fe
level
Willis's Batteries
440 feet perpendicular from the Isthmus
Powder Magazine
Sea
Old Moorish Castle
Hanover Lane
Princes Lines
Guard house
Forbes Guard
Kings Lines
Inundation
Cause-way
Landport Gate
Grand Battery Guard house
Covert Way
Landport Ditch
Grand Battery
Store house
Esplanade

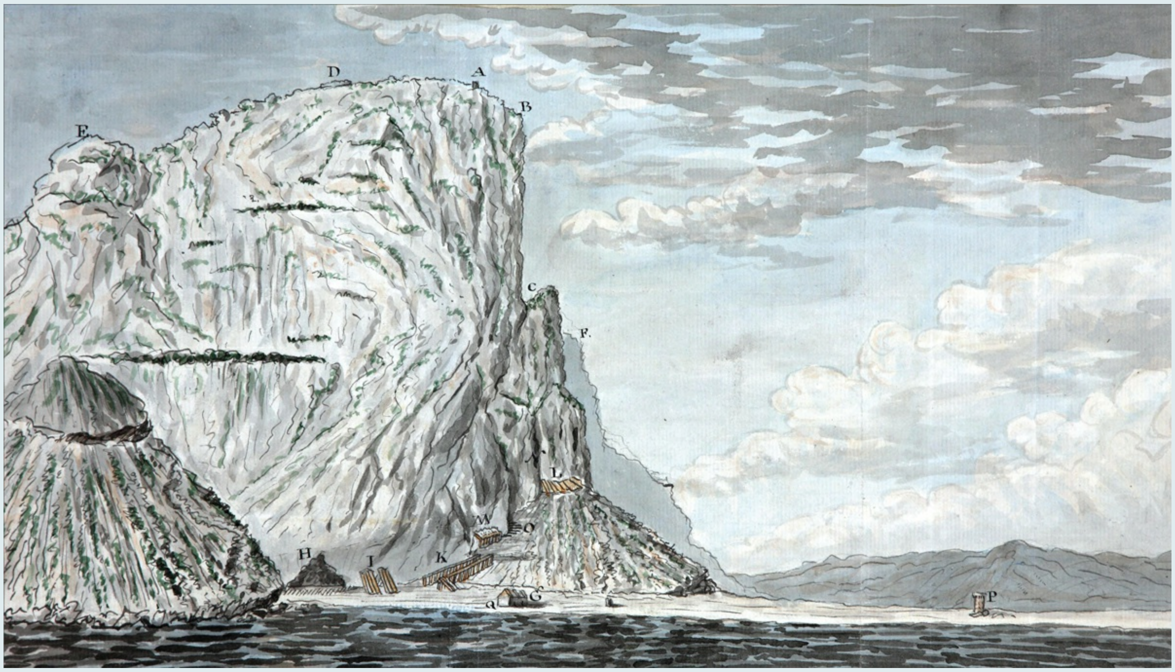
GIBRALTAR FROM THE FLAG STAFF ON THE GRAND BATTERY 1782.



VIEW OF THE ATTACK MADE BY SPANISH BATTERING SHIPS ON THE GARRISON OF GIBRALTAR 13 SEPTEMBER 1782.



GIBRALTAR FROM THE SUMMIT OF THE SUGAR LOAF 1782.


D
A
B
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C
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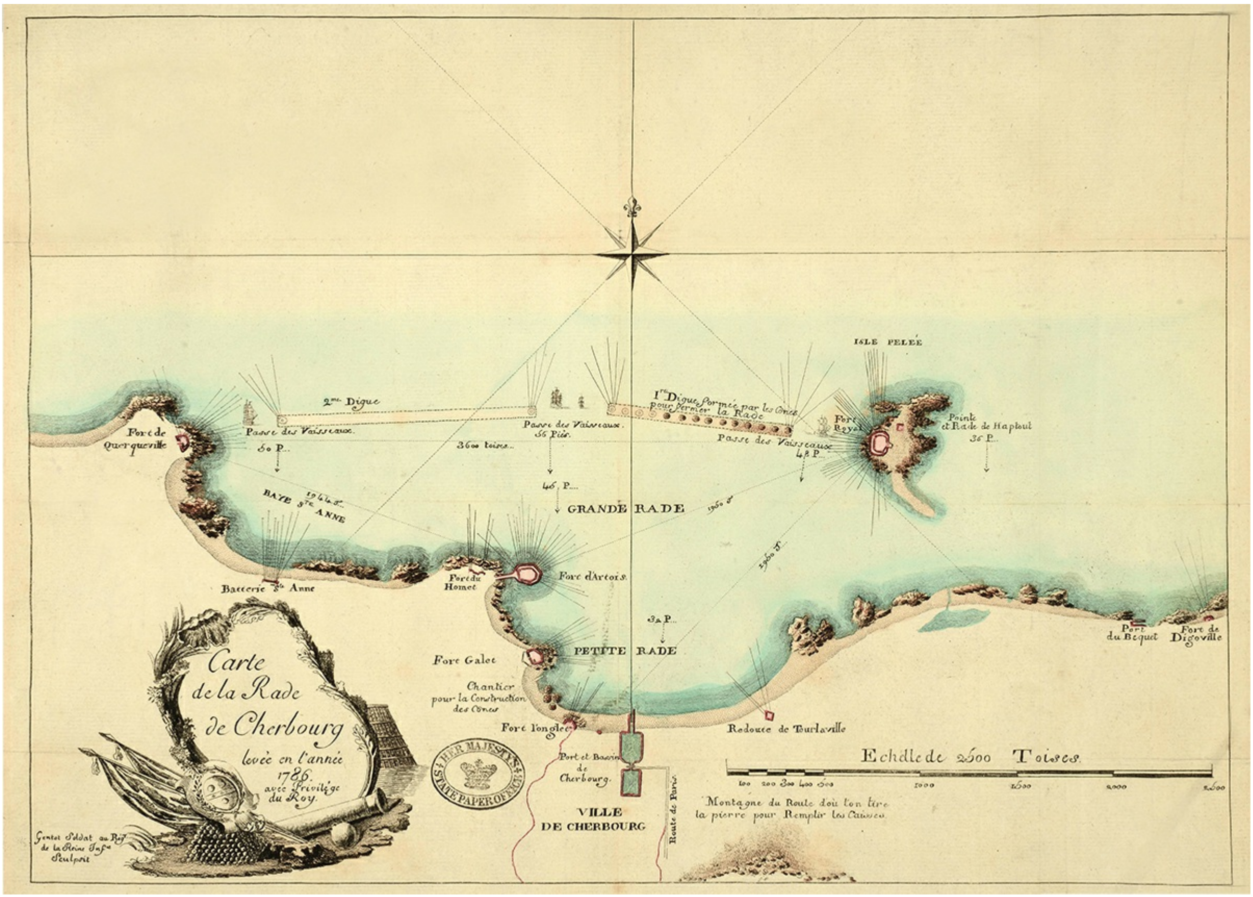
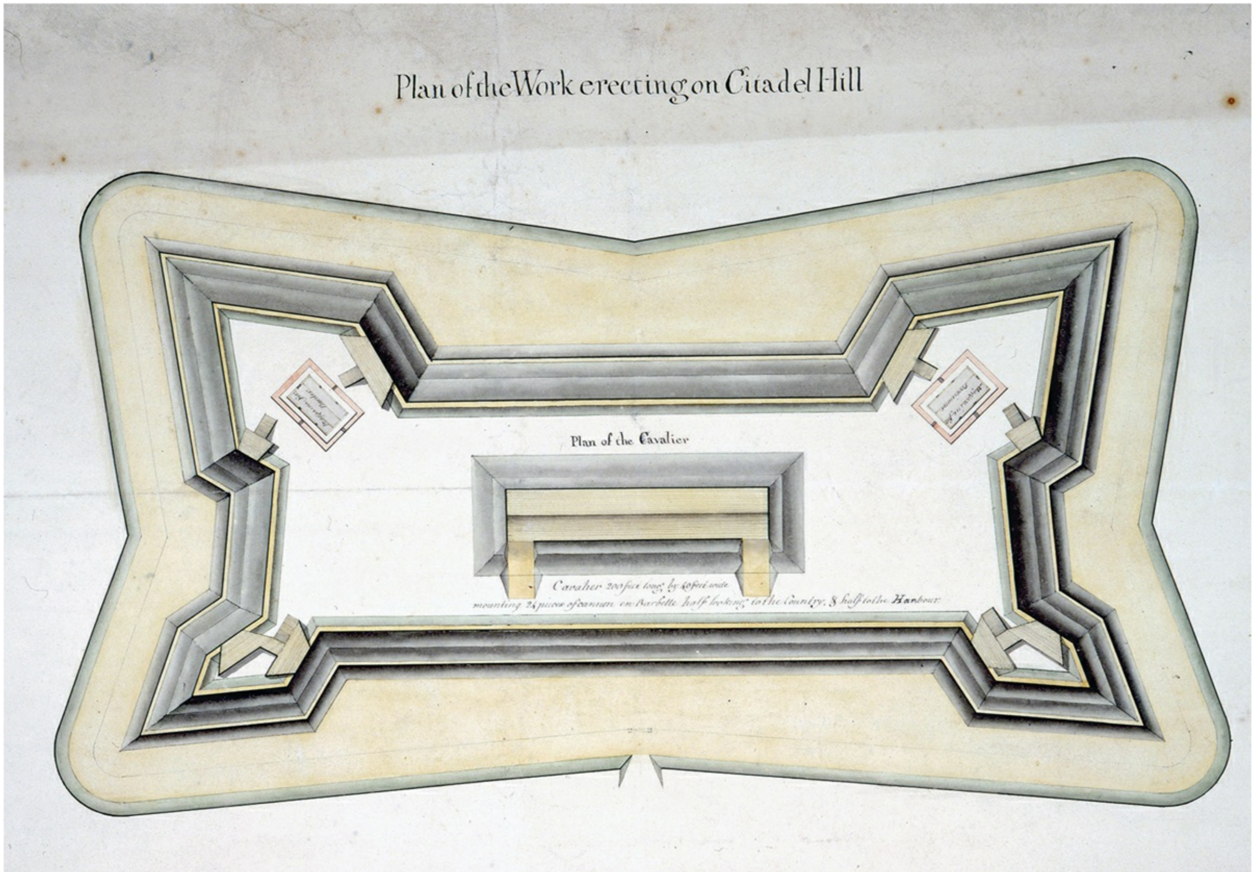
P

VIEW OF THE ENEMY’S POSITION UNDER THE NORTH-EAST PART OF THE ROCK, GIBRALTAR 1782.

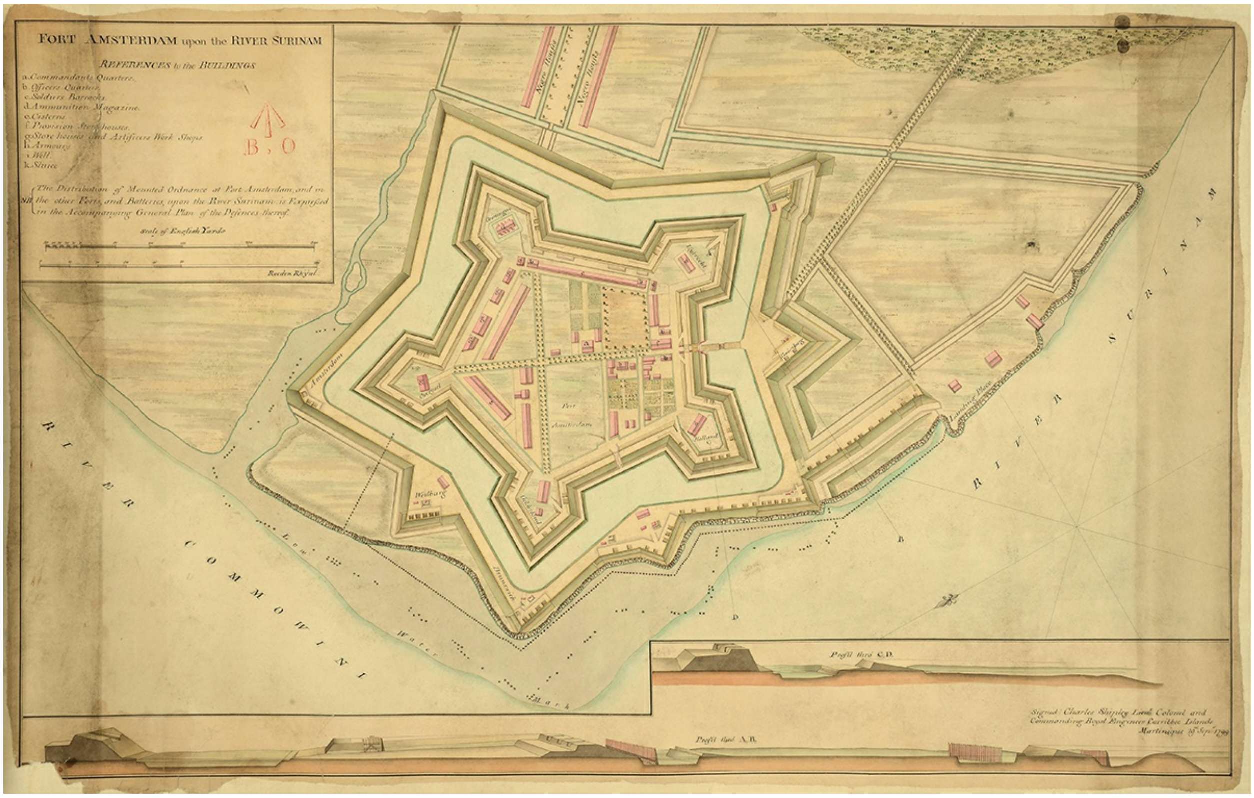

ISLE PELÉE
2me Digue
1re Digue formée par les Cônes pour fermer la Rade
Fort de Querqueville
Passe des Vaisseaux.
50 P...
Passe des Vaisseaux. 56 Piés.
3600 toises...
Passe des Vaisseaux 48 P...
Fort Royal
Point et Rade de Haptoul
36 P...
BAYE Ste ANNE
1964 t...
46 P...
GRANDE RADE
1960 t
1960 t...
Batterie Ste Anne
Fort du Homet
Fort d'Artois.
3a P...
PETITE RADE
Fort Galet
Chantier pour la Construction des Cônes
Fort l'onglée
Port et Bassin de Cherbourg.
VILLE DE CHERBOURG
Route de Paris
Redoute de Tourlaville
Port du Bequet
Fort de Digoville
Echelle de 2500 Toises
100 200 300 400 500 1000 1500 2000 2500
Montagne du Roule doù l'on tire la pierre pour Remplir les Caisses
Carte de la Rade de Cherbourg levée en l'année 1786. avec Privilége du Roy.
HER MAJESTY'S STATE PAPER OFFICE
Gentot Soldat au Regt de la Reine Infie Sculpsit

CHERBOURG, FRANCE, 1786 Successfully raided by the British in 1758, when its fortifications were destroyed, Cherbourg became newly significant when the Franco-Spanish invasion attempt on southern England in 1779 failed. Cherbourg offered a better and closer base than Brest and could apparently be used to help France attain strategic mastery over the Channel, providing a key base for its growing navy. Cherbourg had a harbour large enough for 80 warships, it was argued. A 4km-long fortified breakwater was seen as a key element. Construction began in 1783, and in 1786 Louis XVI visited the works. British concern led to interest in improving the defences of Portsmouth and Plymouth, not least because of exaggerated reports of the scheme's potential. Daniel Hailes, Secretary of Embassy in Paris, warned that the harbour would be able to contain 100 ships of the line and that a tower 60ft high could be built nearby that would command the entire Channel, not least British naval movements from Portsmouth. William Eden, a British diplomat in France, predicted accurately in 1786 that 'John Bull will rub his eyes'.

The French focus on warfare on land ensured a suspension of works between 1792 and 1802. Napoleon then pressed it forward, only for there to be a break again between 1813 and 1832. The naval base, in the shape of the Napoleon III docks, was not opened until 1858. This deep-water anchorage then became of great concern to the British and again encouraged the fortification of British naval positions on the south coast of England.


Plan of the Work erecting on Citadel Hill
Plan of the Cavalier
Cavalier 200 feet long by 60 feet wide
mounting 24 pieces of cannon on Barbette half looking to the Country & half to the Harbour

CITADEL WORKS AT HALIFAX, NOVA SCOTIA, 1796 The outbreak of war with France in 1793 led to new concerns about the security of British positions, notably so in 1795–96 when France obtained the support first of the Dutch and then of the Spanish navy. Relations with the United States also caused concern. The loss of the Thirteen Colonies in 1783 ensured that Halifax was even more important than hitherto. A note on the map reads: ‘It is proposed to finish the Bastions first because in case of a sudden attack, they can be turned into Redoubts by shutting the Gorges.’ This provided a defence in stages. A gorge is the rear part of an independent fieldwork or detached outwork. The existing citadel was in ruins, and the new one was completed by 1800. To accommodate the fortress, the top of the hill was levelled and lowered. Four bastions surrounded a central barracks and magazine. This citadel, which was repaired during the War of 1812 in case of American attack, did not see action.


FORT AMSTERDAM upon the RIVER SURINAM
REFERENCES to the BUILDINGS
a. Commandants Quarters.
b. Officers Quarters.
c. Soldiers Barracks.
d. Ammunition Magazine.
e. Cisterns.
f. Provision Store houses.
g. Store houses and Artificers Work Shops.
h. Armoury.
i. Well.
k. Sluice.
B, O
NB The Distribution of Mounted Ordnance at Fort Amsterdam, and in the other Forts, and Batteries, upon the River Surinam is Expressed in the Accompanying General Plan of the Defences thereof.
Scale of English Yards
Roeden Rhynl
Negro Houses
Negro Houses
Fort Amsterdam
RIVER COMMOWINI
Low Water Mark
RIVER SURINAM
Profil thro' C.D.
Profil thro' A.B.
Signed: Charles Shipley Lieut. Colonel and Commanding Royal Engineers Caribbee Islands
Martinique 15th Sepr. 1799

FORT NEW-AMSTERDAM, SURINAM, 1799 This fort was built at the confluence of the Surinam and Commewijne rivers from 1734 to 1747 to protect Paramaribo, the capital of Surinam or Dutch Guiana, a colony that, with slave labour, produced plantation goods, notably sugar. The colony was captured by the British in 1799.

THE NINETEENTH CENTURY

The nineteenth century is not noted for its fortifications. There is no name to match that of Vauban, and few dramatic remains to stand alongside those of earlier centuries. The majority of the most famous clashes, certainly in Europe, Africa and the Americas, are those of battles, not sieges, and there is a sense of armies on a scale that prevailed over the obstacle posed by mere fortifications. Moreover, the increased range, artillery, mobility and lethality of modern artillery, on both land and at sea, made fortifications appear far more vulnerable. Each of these elements indeed had significance, but they do not capture the continuing importance of fortifications.

The situation during the French Revolutionary and Napoleonic Wars from 1792 to 1815 is instructive. Battles were generally more important than sieges. For example, after their advance on Paris was checked by a large French army at Valmy in 1792, the Prussians under the Duke of Brunswick retreated, ending the siege of Thionville and abandoning the fortified positions of Longwy and Verdun they had captured. Attacked by the Austrians in 1792, Lille could not be completely besieged as they lacked sufficient troops. Instead, they tried to bombard the city into submission, destroying about 600 houses. However, this did not lead to surrender and the Austrians then retreated.

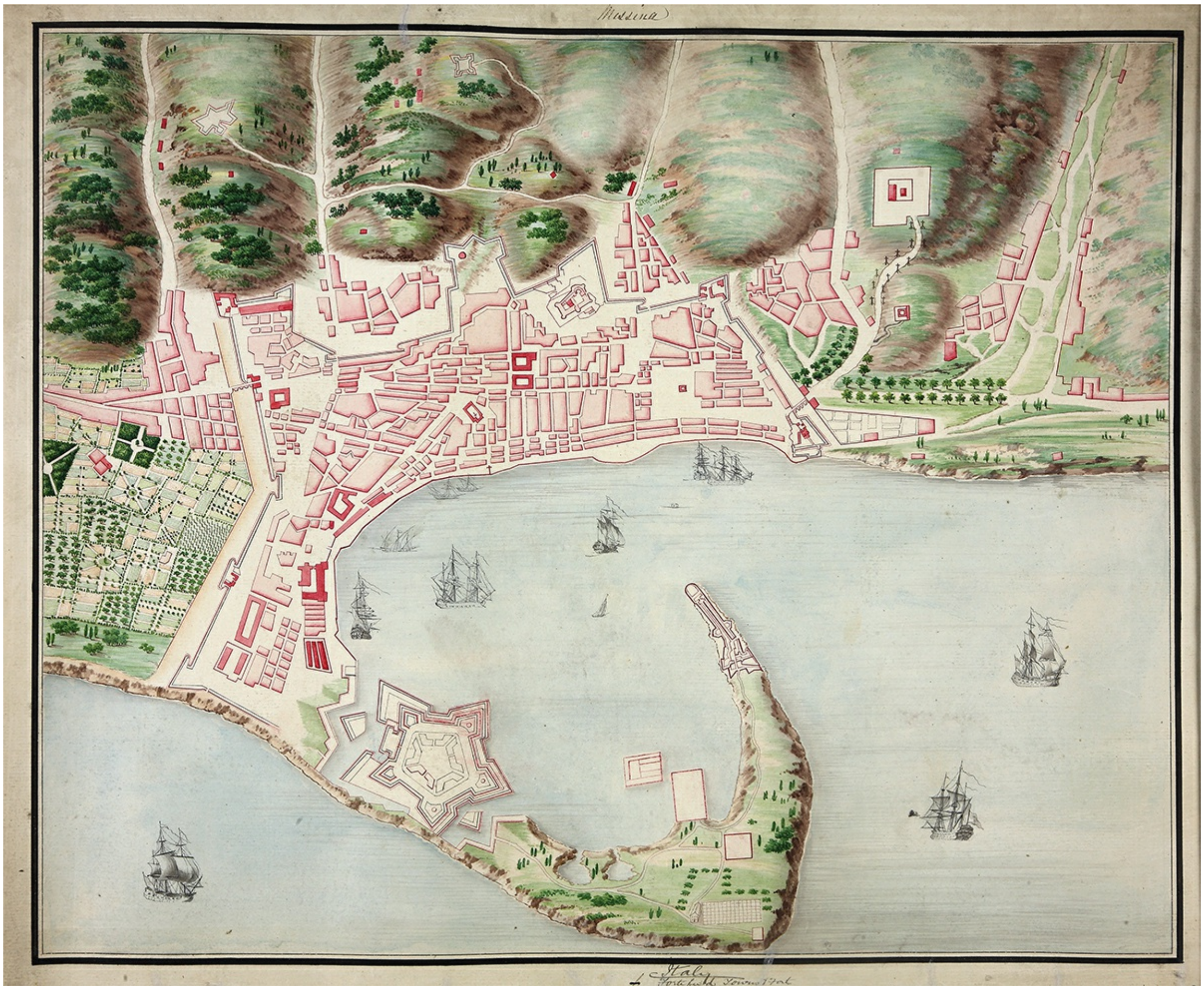
IMPORTANT SIEGES

Nevertheless, the career of Napoleon showed, most clearly at Toulon (1793), Mantua (1796–97) and Acre (1799), that sieges could still be as important as battles. Success at Toulon made his name, Mantua demonstrated that sieges could lead to relief attempts that caused important battles (in his case repeated victories over the Austrians) and the inability to capture well-fortified and ably defended Acre led to the failure of Napoleon's advance north in the Middle East.

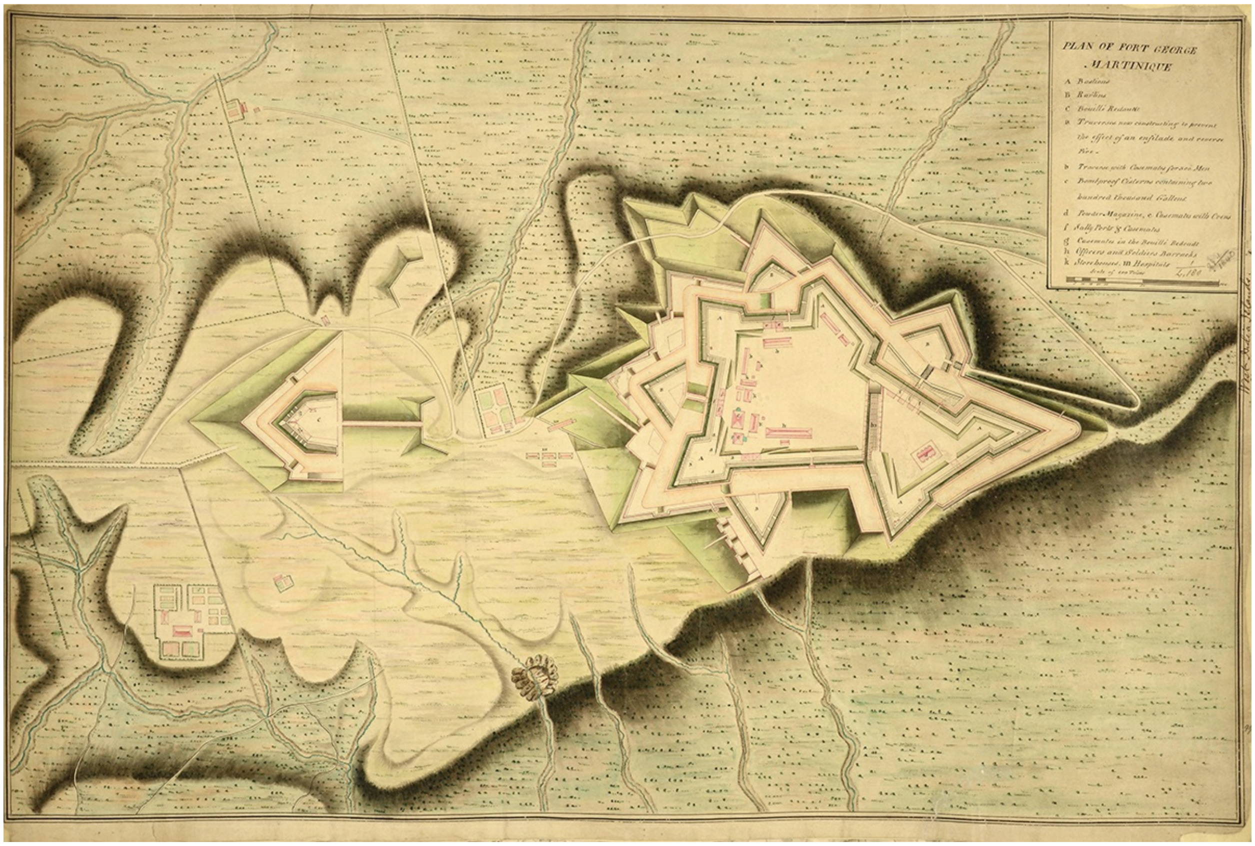
Much depended on the particular theatre of operations. Fortified positions, such as Almeida, Badajoz, Burgos, Cadiz, Ciudad Rodrigo, Pamplona, San Sebastian and Saragossa, and the sieges of them, were very important in the Peninsular War in Portugal and Spain (1808–14). In 1808, the French attacked Saragossa, which was protected by rivers and medieval walls. The French found it easier to break into the city than to dominate its tightly built inside, which was strengthened by barricades. Spanish counter-attacks helped lead to French failure. The French were more successful in their second siege, one supported by heavy bombardments. After breaching the walls, the French fought their way building by building through the city in 1809. With 24,000 of their 32,000 strong garrison casualties, the Spanish force surrendered. About 34,000 civilians and 10,000 French troops also died in this brutal siege.

The Duke of Wellington's creation of the Lines of Torres Vedras in order to protect Lisbon and his army led to the establishment of a large-scale entrenched position that thwarted the French advance in 1810–11 and then exposed the French to the problems of inadequate supplies. Wellington also had to capture positions. In 1812, he stormed by night the two key French-held Spanish border fortresses of Ciudad Rodrigo and Badajoz, the well-defended positions falling when costly attacks on breaches created by artillery fire were supported by subsidiary attacks at other points. However, an attempt to storm Burgos that year failed. Wellington's siegecraft suffered from the absence of an effective engineering branch. Victory in the field provided opportunities to press on with sieges, that at Vitoria (1813) enabling Wellington to besiege and capture San Sebastian and Pamplona.

Attacks on fortified positions faced many problems. The French had succeeded in storming Dutch-held Bergen-op-Zoom in the Netherlands in 1747, but a British attempt to storm the fortress, then French-held, in 1814 failed. The British fought their way into the town, but the fighting then turned against them, the columns that were in the town received insufficient support and were ordered to retreat, and they were driven out with 3,000 casualties. The British had been similarly unsuccessful inside Buenos Aires in 1807, again with heavy casualties.



MESSINA, SICILY, 1800 The harbour of this major Sicilian port was dominated by the Forte del Santissimo Salvatore, built in the 1540s on the end of the peninsula and designed to provide protection from the Ottoman (Turkish) fleet. As such, it was part of a programme of fortification in the territories of the kings of Spain, both in Spain and in Italy. The fort also served to overawe the local population, and that led to its capture during the 1674–78 rebellion. After Messina was brought back under control, a more powerful citadel, designed by Carlos de Grunenbergh, was built between 1680 and 1686 in the centre of the peninsula. Protected from attack from the mainland by a moat, this fort was crucial to the local power of the ruler. A major position during the Wars of the Quadruple Alliance (1718–20) and Polish Succession (1733–35), it was captured by the forces of Philip V of Spain in 1718 and 1735, and by those of Austria in 1719. In the Napoleonic Wars, Sicily was protected from French invasion by the British navy. During the unsuccessful revolution of 1848–49, the rebel-held city was bombarded from the citadel, which held out until relief came. The last position to hold out, the citadel fell to Garibaldi's expedition in 1861. Much of it was demolished in the twentieth century.


PLAN OF FORT GEORGE
MARTINIQUE
A Bastions
B Ravelins
C Bouillé Redoubt
a Traverses now constructing to prevent the effect of an enfilade and reverse Fire
b Traverse with Casemates for 200 Men
c Bombproof Cisterns containing two hundred thousand Gallons
d Powder Magazine, e Casemates with Ovens
f Sally Ports & Casemates
g Casemates in the Bouillé Redoubt
h Officers and Soldiers Barracks
k Storehouses, m Hospitals
Scale of 400 Toises
1/4,180

FORT DESAIX, MARTINIQUE Martinique fell to the British in 1809, after the principal French position, the well-fortified and naturally strong Fort Desaix, was captured following an extremely heavy artillery bombardment. One of the shells detonated the main magazine on 24 February, leading to the surrender of the fortress later that day. Captain Thomas Henry Browne recorded: 'February 20th. Our batteries began their fire, which was truly tremendous, they threw 500 shells, besides quantities of round shot, in the course of the evening… 25th… The inside of the work presented a shocking spectacle of ruins, and blood, and half-buried bodies, and was literally ploughed up, by the shells we had thrown into it.' Having returned Martinique to France in 1814, the British responded to Napoleon's return to power in 1815 by seizing it anew, far more easily than in 1809.

Sieges could also be part of battles at the tactical level, notably at Waterloo in 1815. This battle in part involved the French siege of two hastily fortified farmsteads, Hougoumont and La Haye Sainte, which, respectively, anchored the British right and protected its centre. The first held out despite repeated attacks, while the second only fell late in the battle in part because the garrison was not kept supplied with ammunition. Its fall exposed the Allied centre to damaging French firepower and would have been much more serious had it occurred earlier in the battle, as it should have done had the

French brought up artillery.

Forts played an even more significant role in transoceanic warfare between European powers, not least because the crucial harbours that were central positions in this wider European world were protected by fortifications. The techniques employed to capture forts varied greatly. The impact of disease and other problems of campaigning in the tropics ensured that the British preferred to avoid sieges. Thus, Dutch-held Forts Leyden and Frederica in Surinam were taken in 1804 by bayonet attacks in the face of defensive grapeshot and musket fire; there was no preliminary bombardment.

Sieges generally played a smaller role in conflict in Central and Eastern Europe, although even there they could be important, as with the successful French siege of Prussian-held Danzig in 1807, a siege that completed the military collapse of Prussia. Having encircled Danzig, the French dug siege trenches, and beat off a Russian attempt to relieve the city. The Prussians surrendered once the French built up overwhelming force. In 1813–14, fortresses played a major role in strategy and operations. Napoleon used Dresden as a key *point d'appui* in 1813 for the campaigning that finally failed when he was defeated at Leipzig, while, on a pattern that was to be followed by Hitler in 1944–45, he insisted on trying to hold on to fortresses in East Prussia, Silesia, Poland and eastern Spain. Danzig was successfully besieged by Russian forces in 1813–14.

With fortresses on the coast, it was particularly important to cut them off from supply by sea. The availability of such supply ensured that the French siege of Cadiz, the capital of Spanish resistance, during the Peninsular War failed. In contrast, in 1823, when France intervened in a Spanish civil war and the British remained neutral, Cadiz, again the capital of resistance, this time of liberal opposition to the French-backed king, could be blockaded by sea as well as besieged by land, and fell. Similarly, in 1832, Dutch-held Antwerp fell to a French siege, which in this case was backed by a British blockade.

DIFFERENT TYPES OF FORTRESS

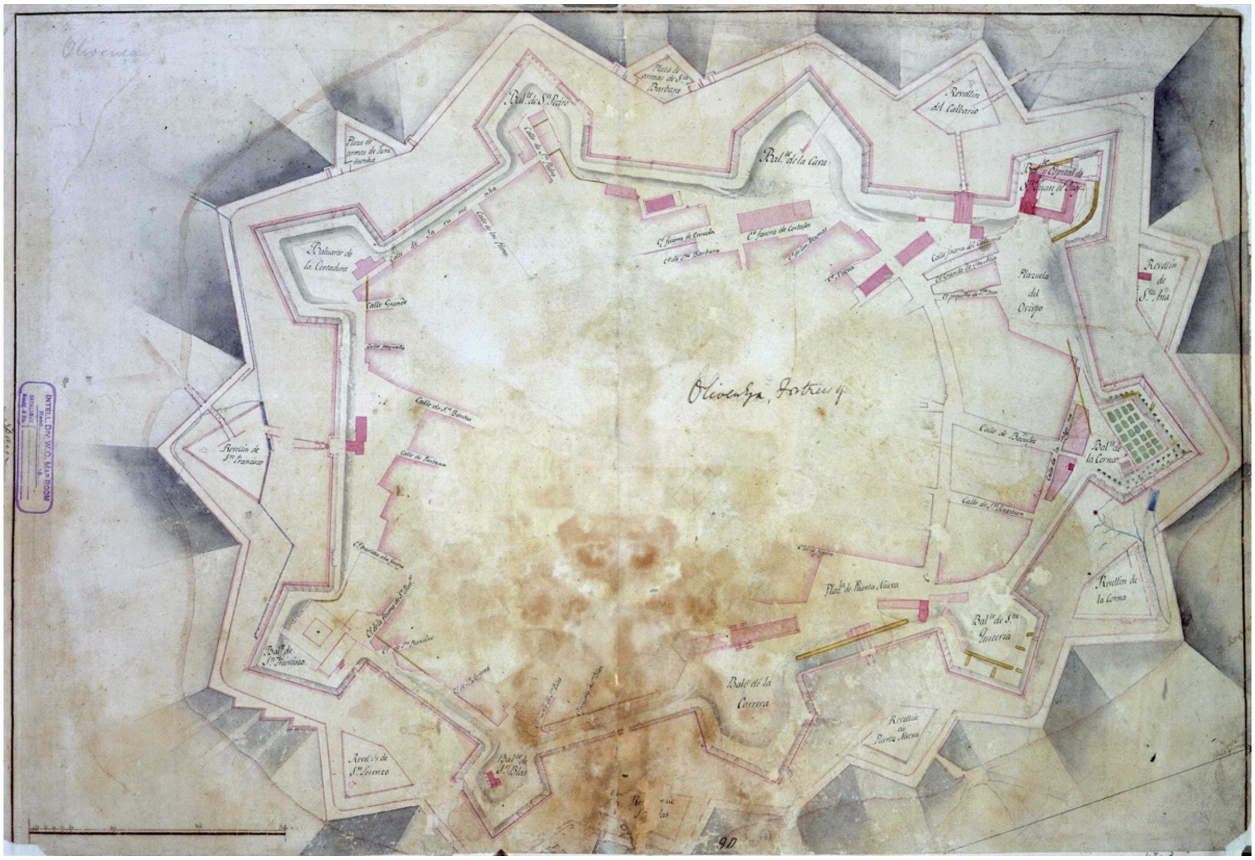
A very different type of fortress was shown in Brussels in 1830, when a Dutch attempt to reimpose control of Belgium, which they had gained under the post-Napoleonic peace settlement agreed in 1814–15 by the Congress of Vienna, was thwarted in street fighting. Their Belgian irregular opponents employed the cover of barricades as well as fire from windows and housetops. This served as a reminder of the significance of fortifications that were scarcely at the cutting edge of military science. The same could be said of Spain during the First and Third Carlist Wars of 1833–40 and 1872–76. The cities tended to back the liberals and Bilbao successfully resisted a Carlist siege in 1835. Similarly, in the Portuguese civil war, the Miguelist failure to storm Oporto and Lisbon in 1833 was very important to the course of the conflict.

In northern Italy, the Austrians benefited from controlling far more impressive fortresses, notably the 'Quadrilateral': Legnano, Mantua, Peschiera and Verona. In 1848, the Austrian commander Josef Radetzky responded to the crisis caused by rebellions in Milan and Venice and the hostile intervention of Piedmontese troops by retreating from Milan into the Quadrilateral, which then served as a base from which he advanced to defeat the Piedmontese forces and suppress the rebellions.

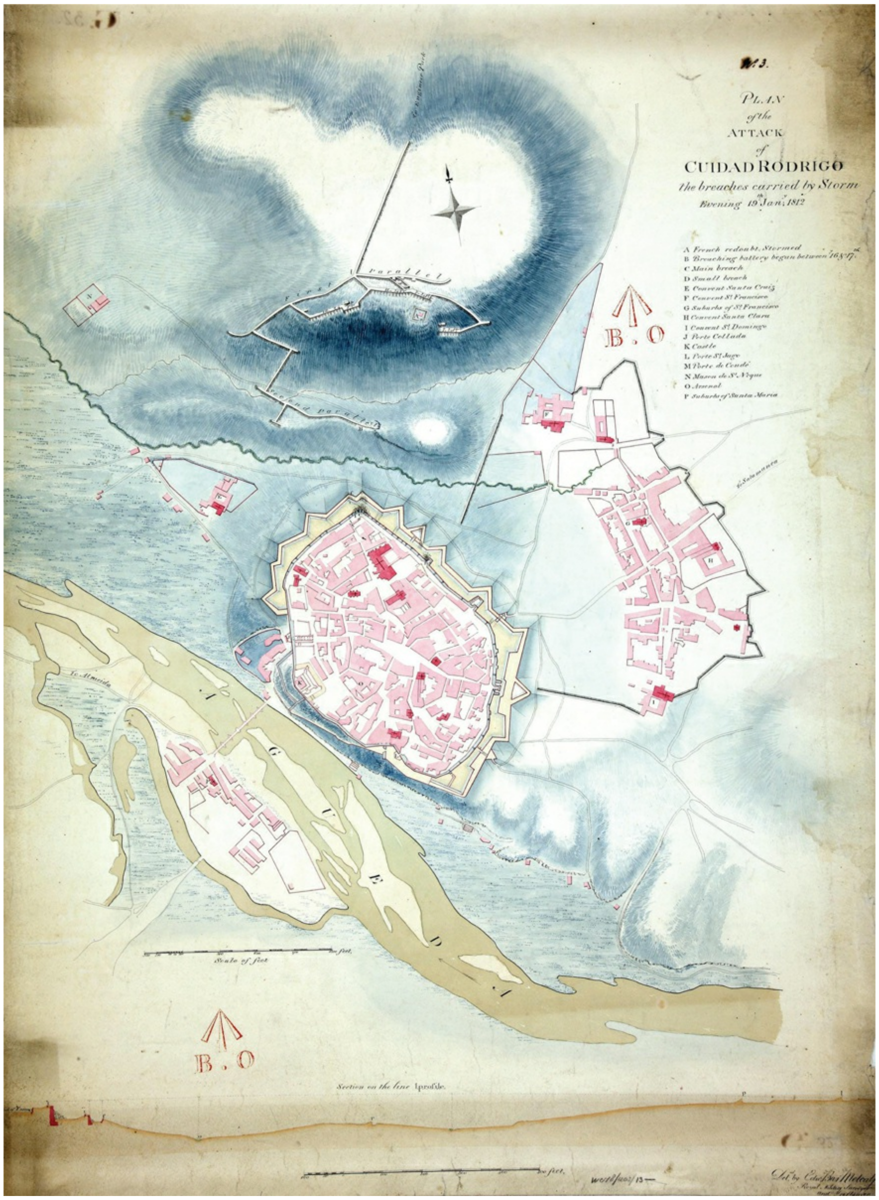
In the first half of the century, increased interest was devoted to the idea of detached forts as an aspect of defensive operations. Initially, these were a form of entrenched camp designed to provide defensive cover for field forces. Later they developed as a ring of detached forts in order to provide defence in depth for a fortress or fortified city, not least by increasing the line of investment that the besiegers had to man, and at the same time provide cover and strength for a field force. The Prussians developed the idea and, in the 1830s, France followed suit, notably at Paris, then Belfort, Besançon and Grenoble, and later Metz. The emphasis on detached fortresses meant that less attention needed to be devoted to the main defensive position. This was seen with the major works at Antwerp begun in 1859, works designed to protect Antwerp itself from bombardment. Detached positions proved their value in the successful defence of Belfort against German siege in 1871, a defence that was very important for French morale as well as in the subsequent territorial settlement.

MEANS OF CONTROL

On the global scale, fortifications remained particularly significant as an expression and means of control, as an imperial presence was established and power was extended. Thus, on the Pacific seaboard of North America, the Russians established a base in California, at Fort Ross, north of San Francisco, in 1812. The Pomos, who lived nearby, reacted violently, but disease and Russian firepower cut their numbers. However, California was too far for the Russians effectively to deploy their power. Fort Ross did not serve as the basis for fresh expansion, and it was sold in 1841.


Olivenza
Plaza de armas de Sta Barbara
Balte de Sn Pedro
Revellin del Calbario
Balte de la Cava
Plaza de armas de Sn ...
Baluarte de la Cortadura
Calle Grande
Revellin de Sn Francisco
Calle de Sn Benitus
Calle de Pastrana
Balte de Sn Francisco
Revellin de Sn Lorenzo
Balte de Sn Blas
Plazuela del Orispo
Revellin de Sta Ana
Olivenza, Fortress
Calle de Barcelos
Balte de la Corrno
Calle de Sn Sebastian
Revellin de la Corrna
Plazta de Puerta Nueva
Balte de Sta Quiteria
Balte de la Carrera
Revellin de Puerta Nueva
INTELL. DIV. W.O. MAP ROOM
9D

OLIVENZA, PORTUGAL AND SPAIN This fortified position near Badajoz protected entry into Spain from Portugal. In March 1811, it was besieged by the French under Marshal Soult, who was under great pressure from Napoleon to launch an invasion of southern Portugal. This, Soult knew, was out of the question, but he needed to show that he was doing something, and clearing the border fortresses that stood in the way was as good as anything. The main objective was always Badajoz (a valuable prize in and of itself), but taking Olivenza looked good and was also very easy, it being a weak place weakly held. The French artillery opened a breach and the garrison swiftly surrendered.


No. 3.
PLAN
of the
ATTACK
of
CUIDAD RODRIGO
the breaches carried by Storm
Evening 19th Jany. 1812
A French redoubt, Stormed
B Breaching battery begun between 16 & 17th
C Main breach
D Small breach
E Convent Santa Cruiz
F Convent St. Francisco
G Suburbs of St. Francisco
H Convent Santa Clara
I Convent St. Domingo
J Porte Collada
K Castle
L Porte St. Jago
M Porte de Condé
N Mason de St. Nique
O Arsenal
P Suburbs of Santa Maria
B.O
B.O
To Salamanca
Scale of feet
Section on the line A profile

CIUDAD RODRIGO, 1812 Plan of the defences and of the British attack, showing, in detail, the breaches taken by storm. A key frontier defence of Spain, matching Badajoz further south. The siege was rapidly pursued in order to prevent French relief. The French force was too small to provide the necessary number of defenders. The British had arrived nearby on 6 January and their trenches were complete by the 12th. The batteries fired over 9,500 rounds. Ciudad Rodrigo was successfully stormed on the evening of 19 January 1812 after two breaches had been opened by bombardment. The British found the great breach well defended, but, having fought in through the small breach, made the defence of the great breach redundant by coming behind it. The British lost 318 dead and 1,378 wounded out of their 10,700 strong force, the French 529 dead or wounded and 1,471 captured, as well as 153 cannon. This success enabled Wellington either to advance further into Spain, or, as he did, to turn south and attack Badajoz. The events at Ciudad Rodrigo can still be readily understood by a visit to the site.

In the Oregon Territory, the British-owned Hudson's Bay Company established many bases below the 49th parallel north, including Forts Boise, Colville, Flathead, George, Nez Percés, Nisqually, Okanagan, Umpqua and Vancouver, several on or south of the Columbia River, and this presence posed a challenge to American expansionism. However, a British report in the winter of 1845–46 on the Company's forts categorised them as 'capable of making a good defence against irregular or Indian forces,' 'incapable of making any defence', or 'capable of resisting a sudden attack from Indians or an irregular force without field guns'.

The Americans built forts when they advanced, for example Fort Madison in Iowa in 1808 and Fort Harrison (Terre Haute) in 1811, and to stabilise the situation after defeats, for example Forts Meigs (Maumee) and Stephenson (Fremont) in 1813. In the Second Seminole War in Florida (1835–42), a system of forts, and the roads that linked them, provided an infrastructure for the American forces, but these forts could not prevent the Seminole from moving between them. Similarly, in the Java War of 1825–30, the Dutch developed a network of fortified bases from which they sent out mobile columns.

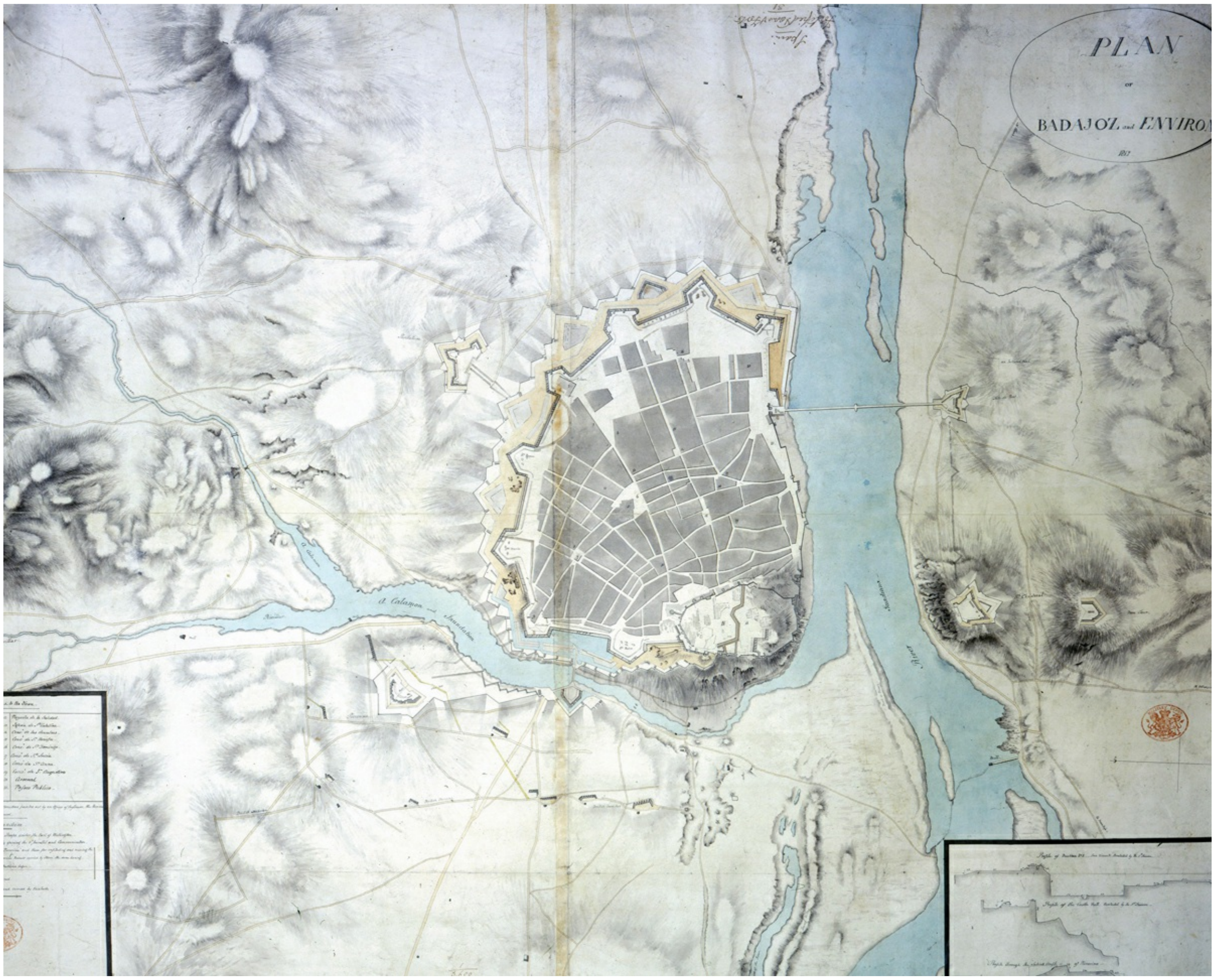
After the War of 1812, American fort building included a chain from Lake Michigan to the Upper Mississippi River, as well as forts further south, for example Fort Smith in Arkansas in 1817. Moving into the Great Plains and developing mounted forces permitted a lower density in fortifications than would otherwise have been necessary, with forts such as Fort Scott in eastern Kansas established in 1842. While forts could be bypassed by Native American raiders, they were difficult to take.

The annexation of Texas and the Mexican-American War (1846–48) were followed by a major extension of the fortification imprint. This was not a matter of random building. Instead, the forts reflected a series of politico-strategic objectives. The establishment of garrisons in forts met the needs of settlers for reassurance, but the War Department preferred to see troops concentrated in large forces, which was seen as the best way to maintain discipline and training, and to intimidate opponents. Border fortifications, which served to define the border and to mark a federal presence there, included Camp Ringgold at Rio Grande City, Fort Bliss at El Paso, Fort

Duncan near Eagle Pass, and Camp Drum at Zapata.

Forts were also built along the edge of a settlement in order to protect it from Native American attack. Thus, the war was followed in Texas by the establishment of Forts Worth, Graham, Gates, Croghan, Martin Scott, Lincoln and Inge. Westward moves of the line of settlement led to new forts and to the closure of many earlier ones. Thus, in Texas in the early 1850s, new forts included Merrill, Belknap, Chadbourne, McKavett, Terrett, Ewell and Clark. There were also camps such as Joseph E. Johnston and Elizabeth. A double line of forts was seen as the best way to deter Native American raids. However, strategic thinking developed in favour of using forts as a base for offensive campaigns against Native American homelands. The general desire to control the Native Americans led to the construction of forts in west Texas, for example Davis, Lancaster, Quitman and Stockton.

American forts were also built further north. The Santa Fé Trail was guarded by Forts Atkinson and Union. In Minnesota, Fort Snelling, the first American fort there, built in 1819, was followed in 1848 by Fort Marcy, which was designed to keep the Winnebago peaceful. The onward movement of the frontier of concern led to the foundation in 1853 of Fort Ridgely on the Sioux reservation on the upper Minnesota River and in 1856 to an expedition to the Red River Valley in Dakota Territory and the establishment of Fort Abercrombie in 1857. Fort Ripley was evacuated in 1857, although that led the Chippewa to an outbreak of violence, which caused the reoccupation of the post. The costs of supplying these distant posts were heavy, and fortification reflected the increasing wealth of the United States.



SIEGE OF BADAJOZ, SPAIN, 1812 A major episode in the Peninsular War in which an Anglo-Portuguese army under Wellington besieged the well-fortified French-held fortress of Badajoz from 16 March. Badajoz had already survived two British sieges in 1811; both were abandoned in the face of stronger French relief forces. The strong wall was strengthened by bastions. Although delayed by heavy rain, bombardment led to breaches and then to a costly night storming on 6 April. As at Ciudad Rodrigo, the main assault was supported by subsidiary attacks. The Allies had 4,800 men dead or wounded.

There was no equivalent enlargement of the American army to reflect the lands gained, but instead a transfer of forces from east of the Mississippi and, by 1860, the end of most garrisons on the Canadian border, on the Atlantic coast, in Florida and in the Mississippi valley. This reflected the extent to which, from the 1840s, Americans were no longer interested in pushing the Native Americans back and instead sought total control of the whole of America. This redistribution of garrisons was also a product of greatly eased relations with Britain in the 1850s. Fort Scott was abandoned by the army in 1855.

The process could also be seen elsewhere. Buying Alaska from Russia in 1867, the United States rapidly established forts in order to assert control there. The coastal location of these forts, which included Fort Tongass, on Portland Channel facing British territory, Fort Kodiak, Fort Wrangell on an island at the mouth of the Stikine River and Fort Kenay near the head of Cook Inlet, reflected the distribution of population, the possibilities for trade and the extent to which any attack by other powers would come by sea.

The Russians, in turn, continued their establishment of fortified lines to anchor and cover their advances. To the east of the Caspian Sea, the annexation in 1822 of the lands of the Middle Kazak Horde both introduced administrative dominance based on forts and used fortified lines to bring much of the best pasture land under control. In the 1830s and 1840s the advance of Russian forts and settlers in Kazakhstan continued. In the Senegal Valley, under General Louis Faidherbe, the Governor of Senegal from 1854 to 1865, French expansion into the interior was anchored by the development of an effective chain of riverine forts linked by steamboats.

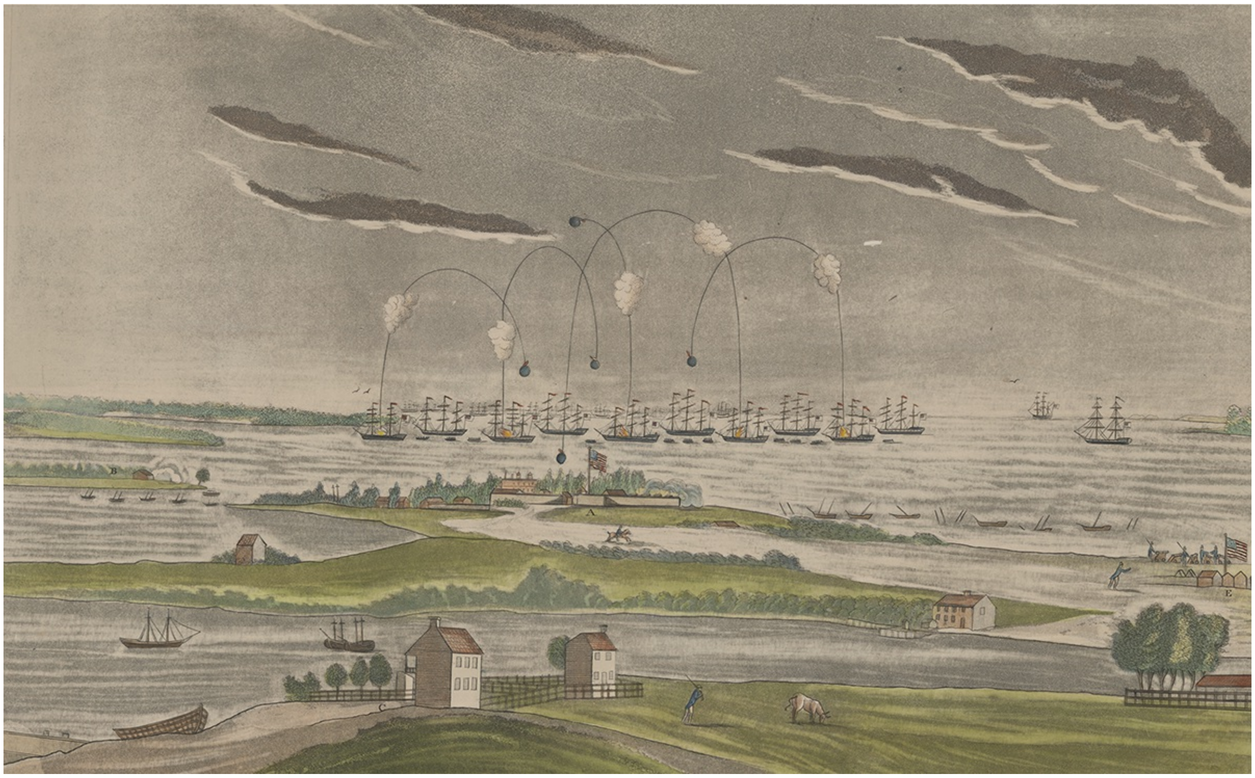
NON-WESTERN RESPONSE

The fortifications of non-Western powers could resist Western forces that lacked appropriate artillery, as with the four unsuccessful British attempts to storm Bharatpur in India in 1805 and the difficulties the British faced attacking Gurkha hill forts and stockades in Nepal in 1814–15. At Bharatpur, General Gerard Lake had only four 18-pounders and insufficient ammunition and was unable both to neutralise the defensive fire and to blow the gates in. He also misjudged the depth of the ditch and the height of the walls, and his operations were affected by Maratha countermining.

However, such fortifications proved increasingly vulnerable to Western firepower, even if many of the attacks were driven home by storming, as with that on Constantine in Algeria by the conquering French in 1837 and of the Abyssinian fortress of Magdala by the British in 1868. In the Russo-Turkish War of 1806–12, the extensive fortifications in the Turkish defensive system on the Danube delayed the Russians, but in 1809–10 they captured them. In the next war with Turkey, the Russians captured Varna (1828), in a siege personally directed by Tsar Nicholas I, and Adrianople (1829).

In New Zealand, nevertheless, the Maori responded ably to British artillery and they dug well-sited trench and *pa* (fort) systems that were difficult to bombard or storm, adopting layouts in order to increase the potential for their own muskets. The Maori inflicted serious checks on the British in the 1860s. Yet, as a reminder of the need to put the strengths and weaknesses of fortifications in broader contexts, the availability of British, colonial and allied Maori units, and the process of extending control that included road and fort construction, ensured an eventual settlement on British terms.

The overall situation was less favourable for the British in Afghanistan. Although they could make use of fortified positions such as the city of Kandahar in 1880, they also faced the successful Afghan use of relatively simple fortification techniques. Thus, that year, Alfred Cane noted of a sortie against the village of Deh Khoja: ‘We began by shelling the place. There was no reply so 800 of our infantry advanced to the attack when at once a galling fire was opened on them from loopholes around the village. Our men rushed on and entered the village on the south side but only to find it filled with armed men firing from the windows, doors and roofs. It was a hopeless task… had to return in hot haste under the same heavy fire.’



BOMBARDMENT OF FORT McHENRY, UNITED STATES, 1814 Authorised in 1793, the fort barred the access to Baltimore harbour, and, by the spring of 1814, recent measures ensured that close to 60 cannon were moved there while furnaces to heat the cannonballs were also provided, making the projectiles more deadly against shipping. The British were also hindered by the shallow character of the river and the sinking of merchantmen to block it. The British failure to destroy the fort reflected the long range of the British bombardment, which was mounted from beyond the range of the American guns in the fort. The British used a rocket ship and five bomb ketches, each carrying a 13-inch mortar, which could fire a 194-pound cast-iron bomb (shell) two and a half miles. About 1,500–2,000 rockets and bombs were fired, but the defenders only suffered four dead and 24 injured. The fort became a national symbol, celebrated in what eventually became the national anthem.

In 1885, General Roberts stressed the unsuitability of light guns: ‘In Afghanistan, from the absence of roads, it is seldom that artillery can move faster than infantry, and no field gun that we now possess can make any impression on the thick mud walls of which all forts and houses in that country are built.’

Speed and firepower were also significant elsewhere. In Senegal and Algeria, the French employed artillery to breach the gates of positions, and then stormed them. Artillery, especially 95mm siege guns using powerful explosives, played a crucial role in the conquest of the Tukulor forts by the French in 1890–91, and the walls of Kano in Nigeria were breached within an hour by British cannon in 1903. Artillery was, more generally, important to European columns as they advanced against non-European opponents.

The absence of resources and logistical infrastructure for lengthy sieges also encouraged the use of storming elsewhere. This was notably so in Latin America. In 1880, during the War of the Pacific, the strongly fortified Peruvian port of Arica resisted a Chilean naval bombardment and subsequently a land one, before falling to a night-time storming.

Sieges, moreover, proved totemic occasions. This was the case whether they were successful, as with the heavy bombardment by Confederate forces of beleaguered Fort Sumter in Charleston harbour in 1861 (more than 3,000 shells and shot were fired) or the fall of Sudan’s capital, Khartoum, to Mahdist attack in 1885, with the garrison commander, Major-General Charles Gordon, being killed; or unsuccessful, as in 1899–1900, when Boer sieges of British garrisons at Kimberley, Ladysmith and Mafeking in South Africa were all relieved. Subsequently, in the Second Boer War of 1899–1902, the British used a blockhouse system supported by barbed-wire fences in order to extend fortified control.

As with previous centuries, fortification policies were framed in the context of very different strategic cultures and contrasting goals. Thus, General Sir John Burgoyne, Inspector-General of Fortifications, noted in 1856 that Britain needed to rely for its defence on its navy and fortifications because ‘the peace establishment of its land forces is insignificant as compared with those by which it may be assailed; and we may assume that the feelings of the country, its policy, and perhaps its real interests, render it impossible to vie, in its standing military establishments, with the Continental powers’.

OBSOLESCENCE AND INVESTMENT

Improved long-range firepower was a serious threat to existing fortifications, notably masonry exposed to artillery fire. As a result, there was both obsolescence and much investment in improving some defensive positions. The obsolescence of existing fortifications encouraged the dismantling of city walls, a process supported by the popular view that the age of towns as fortresses had passed. In 1857, Emperor Franz Joseph decided to raze Vienna’s defensive walls, which made land around the new Ringstrasse available for development. Similarly, Copenhagen, formerly essentially a defensive citadel as a whole, with moats, ramparts and gates, was transformed with the moats changed into parks, although the fortress remained as a separate citadel on the edge of the city, as it still does. Its easy capture with no casualties was an important step in the rapid German seizure of the city in 1940.

The American Civil War of 1861–65 and the Franco-German War of 1870–71 had shown the weakness of fortified positions. In the former case, European observers were deeply impressed by the failure of masonry before modern guns. In France, Strasbourg was successfully shelled into surrender, while the shelling of Paris in 1871, a response to the German unwillingness to risk the casualties a storming would entail, inflicted much damage. Burgoyne himself had suggested in 1856:

> **‘The progress in the state of gunnery and steam navigation renders it necessary to reconsider from time to time the principles of attack and defence of coasts and harbours. Whatever improvements may be made in land batteries, their entire adequacy for the purpose of defence cannot be certain against the rapidity of steamers, and the**

> **facility of their manoeuvring power… but they may be powerful in combination with… the floating batteries with their sides coated with thick iron plates.’**

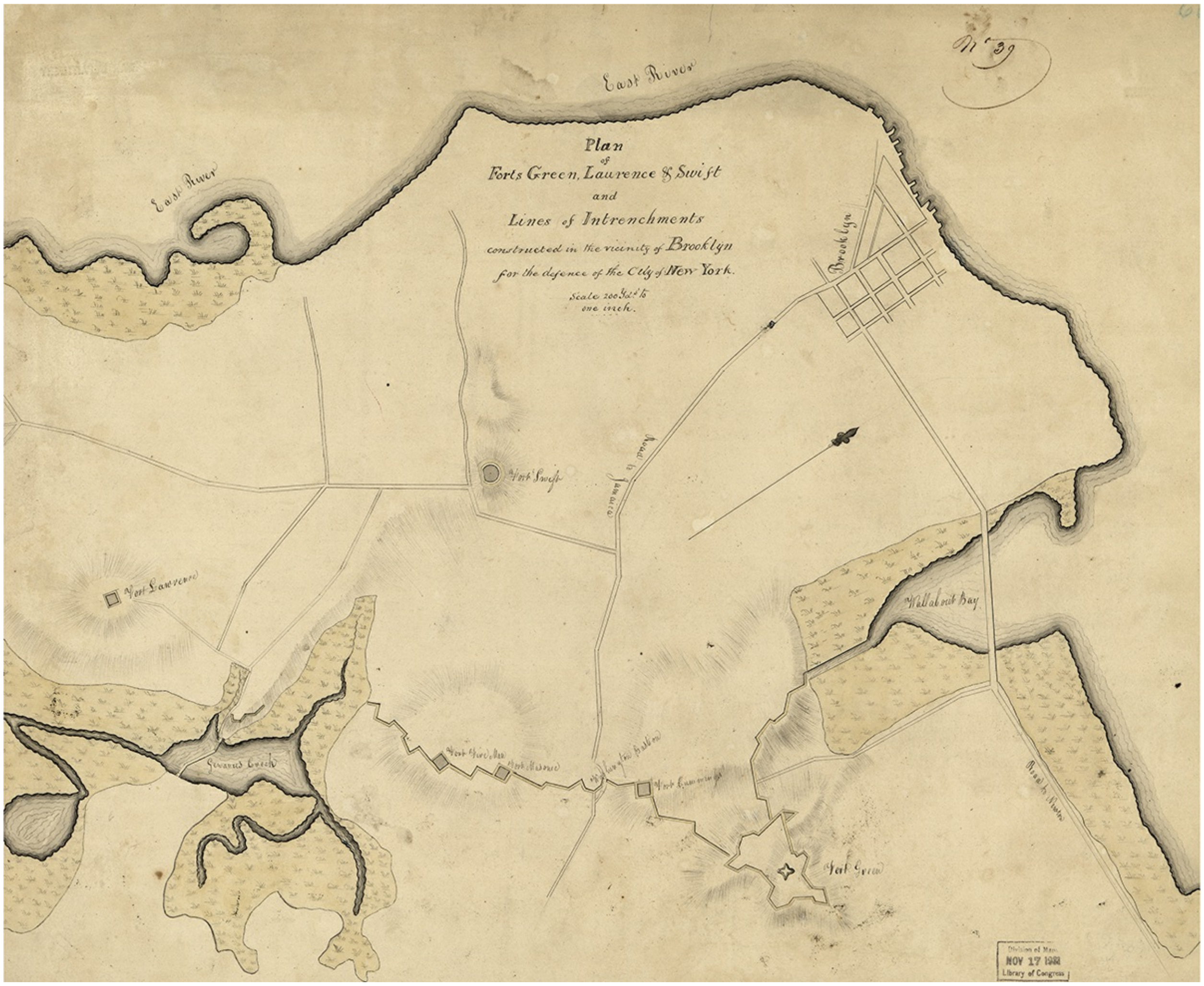
In other words, a combination defence of mobile and fixed fortifications was seen as crucial. In attack, when a British fleet had bombarded Egyptian-held Acre in 1840, steamers had showed their ability to operate inshore, while a shell caused the explosion of the fortress’s main magazine. However, the Anglo-French naval bombardments of Odessa and Sevastopol in 1854 also underlined the vulnerability of wooden warships to effective fire.

After defeat by Germany in 1870–71, the French, as part of a policy of rapid rearmament, created an extensive defensive belt to prevent further German advances in the event of another war. As a result of territorial losses in Alsace and Lorraine in the 1870–71 war, the still outnumbered French now had less space in which to manoeuvre in case of a German attack. French military bases such as Belfort and Verdun were therefore surrounded with fortified positions. They were to be significant in the strategy and operational history of World War I.

Fortifications and sieges were important in Russia’s wars with the Turks. Russia’s major Black Sea naval base, well-defended Sevastopol, was a serious challenge to besieging Anglo-French forces during the Crimean War of 1854–56. The Russian army was strongly entrenched outside the town, making able use of earth defences and supported by more than 1,000 cannon. In turn, invading Russian forces found Turkish-held Plevna and its redoubts a major obstacle in Bulgaria in 1877. In the end, both positions fell. Yet they had caused major delays for the attackers, and this helped to narrow their strategic possibilities. In the defence of Plevna, begun in July 1877, the entrenched Turks, ably commanded by Osman Pasha, used American-manufactured Peabody rifles and inflicted heavy casualties on Russian frontal attacks, which suffered from inadequate preparation and planning. In the second assault, Russian casualties amounted to 23 per cent of their rank and file. The besieged Plevna eventually fell after the defenders, their food stores nearly exhausted, mounted a sortie on 9 December. It was defeated and Osman Pasha then surrendered.

REACTION TO IMPROVED WEAPONRY

The effectiveness of fortifications continued to be challenged by advances in explosives and artillery – especially the development of rifled steel breech-loaders, delayed action fuses and improved pneumatic recoil mechanisms that obviated the need for resiting artillery before firing anew. These advances ensured that it was necessary to put more effort into strengthening fortifications and building detached fortresses at a greater distance from the main position. Vulnerability to artillery attack meant that there was considerable controversy over how best to respond, comparable to that over the best response to battleships. Stronger fortifications, in the shape of steel turrets and disappearing cupolas, was one remedy, but it was contested by commentators who pressed for the location of guns in concealed positions and for moving them among such positions.


Plan of Forts Green, Laurence & Swift and Lines of Intrenchments constructed in the vicinity of Brooklyn for the defence of the City of New York.
Scale 200 Yds to one inch.
East River
East River
Brooklyn
Fort Swift
Fort Laurence
Fort Green
Fort Cummings
Wallabout Bay
Road to Jamaica

DEFENDING AGAINST THE BRITISH, UNITED STATES, 1814 Plans show Forts Green, Laurence and Swift and lines of entrenchments constructed near Brooklyn for the defence of New York against the British in 1814. The end that year of Britain's war with Napoleon (it briefly revived in 1815) made Britain a more formidable foe for the Americans. In October 1814, the Senate was told, by James Monroe, that New York was at risk. That winter, he pressed for an increase in the army to protect coastal positions. In the event, no attack was launched on New York. Nevertheless, concern about its defence was seen with postwar fortifications, which were explicitly designed against British naval attack.

The French experiments at Fort Malmaison in 1886 appeared to demonstrate the obsolescence of fortifications in the face of high explosive shells, but they led instead to the strengthening of revetments, notably through the use of concrete roofs. Extensive fortress complexes, offering defence in depth, were seen in a number of countries, including Romania, where the capital, Bucharest, was protected, and in Belgium around the cities of Liège, Namur and Antwerp, complexes designed by Henri Brialmont, the 'Belgian Vauban'.

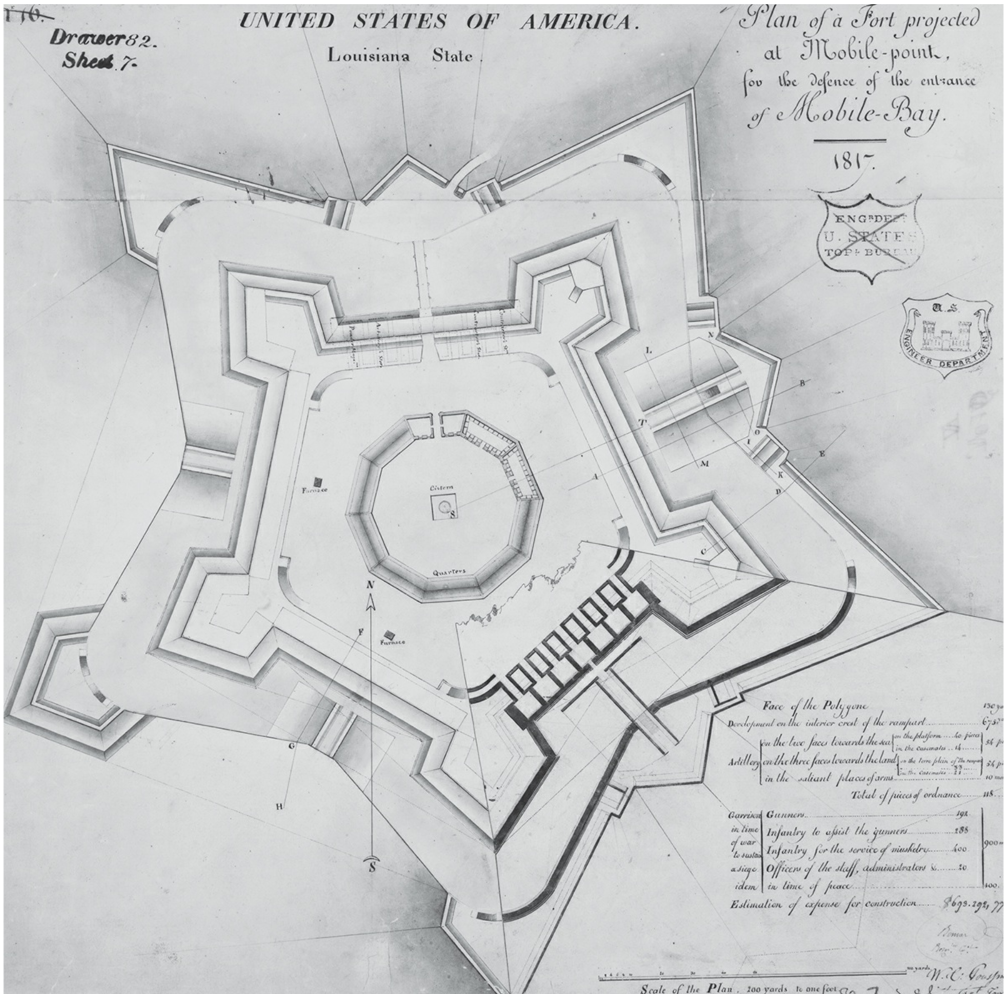
While the extent of defensive systems was altered by the range of modern artillery, the enhanced quality of defensive firepower also offered new possibilities for fortifications. These took the form of the development of practices and systems of field fortification, taking forward the trenches used in the last stage of the American Civil War in 1864–65, notably round Petersburg in Virginia, and the prepared positions employed by the British when defeating Zulu attacks at the battles of Gingindlovu, Khambula and Ulundi in 1879. Indeed, a letter signed 'Colonel' and entitled 'The Boer War – Attacks of positions', published in the *Times* on 27 December 1899, noted with reason:

> **'The modern method of fortifications, introduced with the breech-loading rifle, is based upon the practical indestructibility by modern artillery fire of properly designed earthworks, and the improbability of an attacking force being able to rush a properly prepared position defended by a sufficient number of troops armed with the breech-loading rifle. This improbability became impossibility, now that the magazine rifle is substituted for the breech-loader, until the defences shall have been seriously injured by artillery fire.'**

This situation looked towards the hybrid fortification systems of World War I: the fixed strengths of fortified field entrenchments that came to define much of the conflict. That, however, was not the case during the nineteenth century. Instead, the emphasis across much of the world was on the use of established means of fortification. Unable to appreciate the defensive potential of trenches and the value of mobility, powers, especially Russia, arguably spent too much on fortresses and fortress artillery, which were essentially static, and not enough on field artillery. The latter was mobile, while trenches themselves could be readily dug and were therefore far more flexible and dynamic than fortresses as a defensive system.

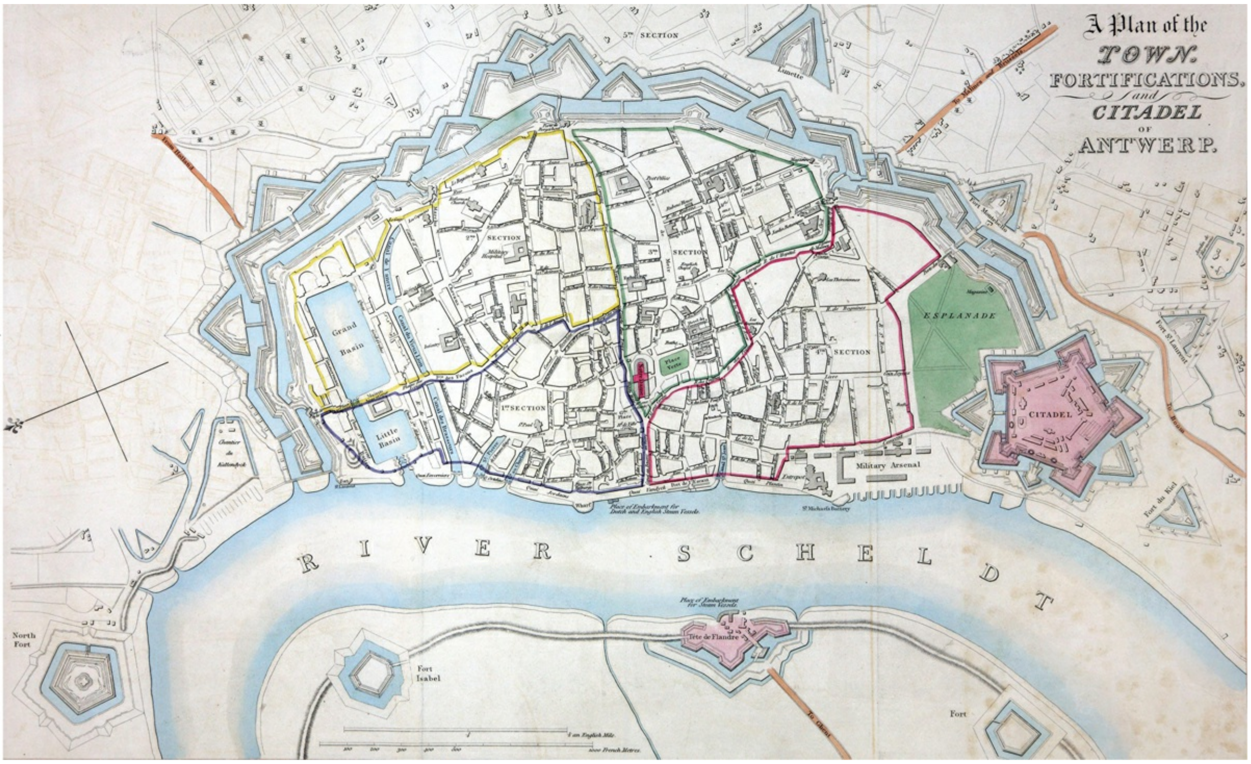
Conversely, the settlement of Anglo-American differences in 1871 meant that Britain withdrew its armed forces from Canada, with the exception of the well-fortified Atlantic naval base at Halifax and the Pacific naval base at Esquimalt. In turn, the American military presence in the Great Lakes was reduced, with Fort Wilkins closed in 1870 and Fort Gratiot in 1879. Decrepit frontier bastions became historic sites.

In the years before World War I, fortified field entrenchments became more significant, notably with the Russo-Japanese War of 1904–05. This included many elements that were to be seen in the world war, notably trench warfare with barbed wire and machine guns, indirect artillery fire, artillery firing from concealed positions, a conflict that did not cease at nightfall and a war waged with continuous front lines. Forward observers were linked by telephone to gunners, who were therefore able to fire on targets beyond visual range. Advocates of the offensive argued that the Russians stood on the defensive and lost, while the more numerous Japanese took the initiative, launched frontal assaults on entrenched forces strengthened by machine guns and quick-firing artillery, as at Port Arthur in 1904–05 and Mukden in 1904, and eventually prevailed, despite horrific casualties. Field fortifications could, it appeared, be overcome by adequate numbers and willpower.

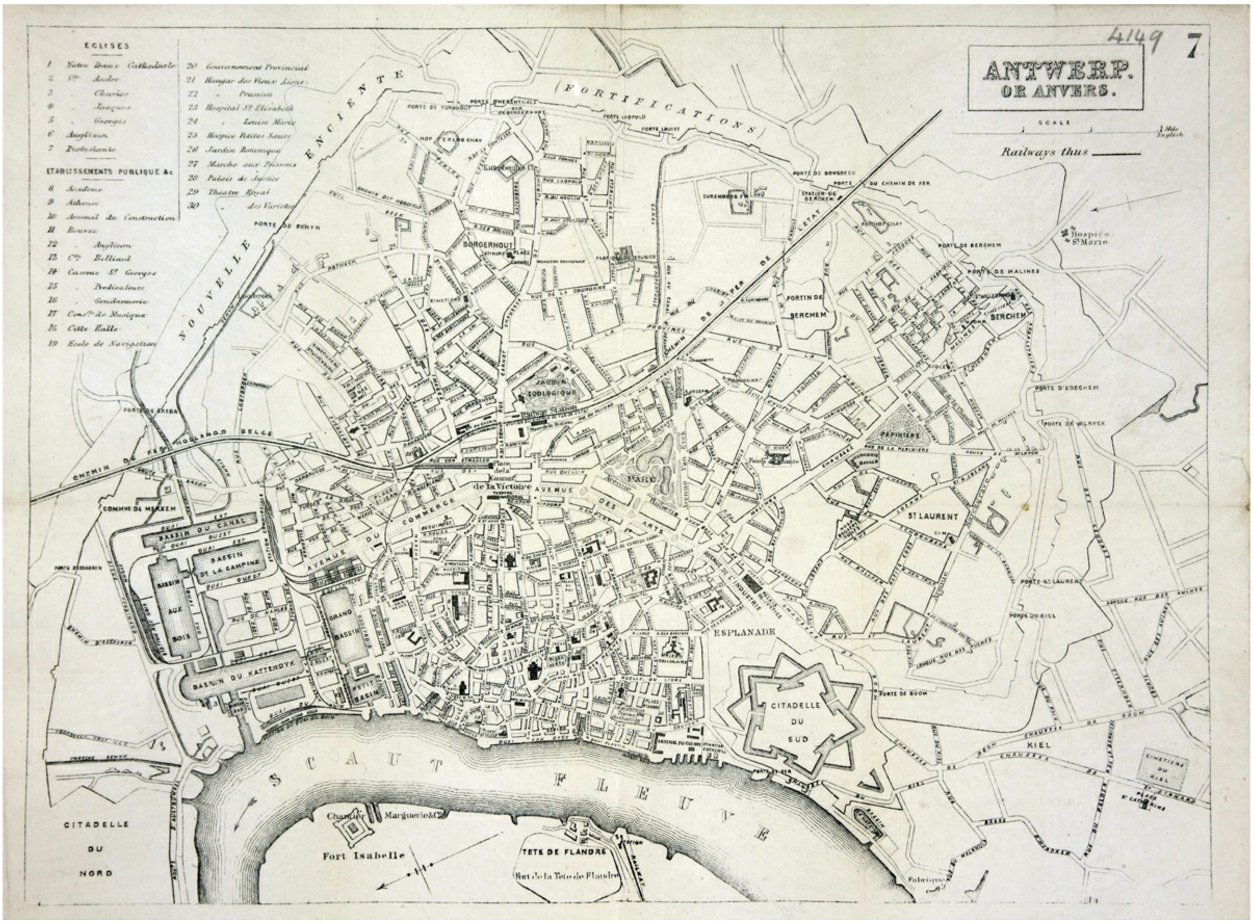

Drawer 82.
Sheet 7.
UNITED STATES OF AMERICA.
Louisiana State
Plan of a Fort projected at Mobile-point, for the defence of the entrance of Mobile-Bay.
1817.
ENGRS DEPT U. STATES TOPL BUREAU
U.S. ENGINEER DEPARTMENT
Cistern
Quarters
Furnace
N
S
Face of the Polygone
Development on the interior crest of the rampart
Artillery
on the two faces towards the sea
on the platform ... 40 pieces
in the casemates .. 14
on the three faces towards the land
in the salient places of arms
Total of pieces of ordnance ... 118
Garrison in time of war to sustain a siege
Gunners ... 192
Infantry to assist the gunners ... 288
Infantry for the service of musketry ... 400
Officers of the staff, administrators &c ... 20
idem in time of peace ... 100.
Estimation of expense for construction ... $693.292,77
Scale of the Plan, 200 yards to one foot

PLAN OF FORT MORGAN, ALABAMA, 1817 Intended to protect Mobile Bay, which the British had attacked with some success in February 1815, the fort was designed by Simon Bernard, who had been a military engineer for Napoleon. Banished from France in 1815, Bernard (1789–1839) was employed by the Americans to design forts and played a key role in developing the Third System Fortifications. Contracted in 1818, the fort was completed, with slave labour, in 1834. Captured by the Confederates in 1861, the fort was bombarded into surrender in 1864 after the battle of Mobile Bay. The forts were criticised by Brigadier-General Edmund Gaines who pressed instead, from 1826, for a rail and canal system financed by the federal government, able to move militia from the hinterland to oppose any British invasion, was well as for the construction of large ironclad warships.

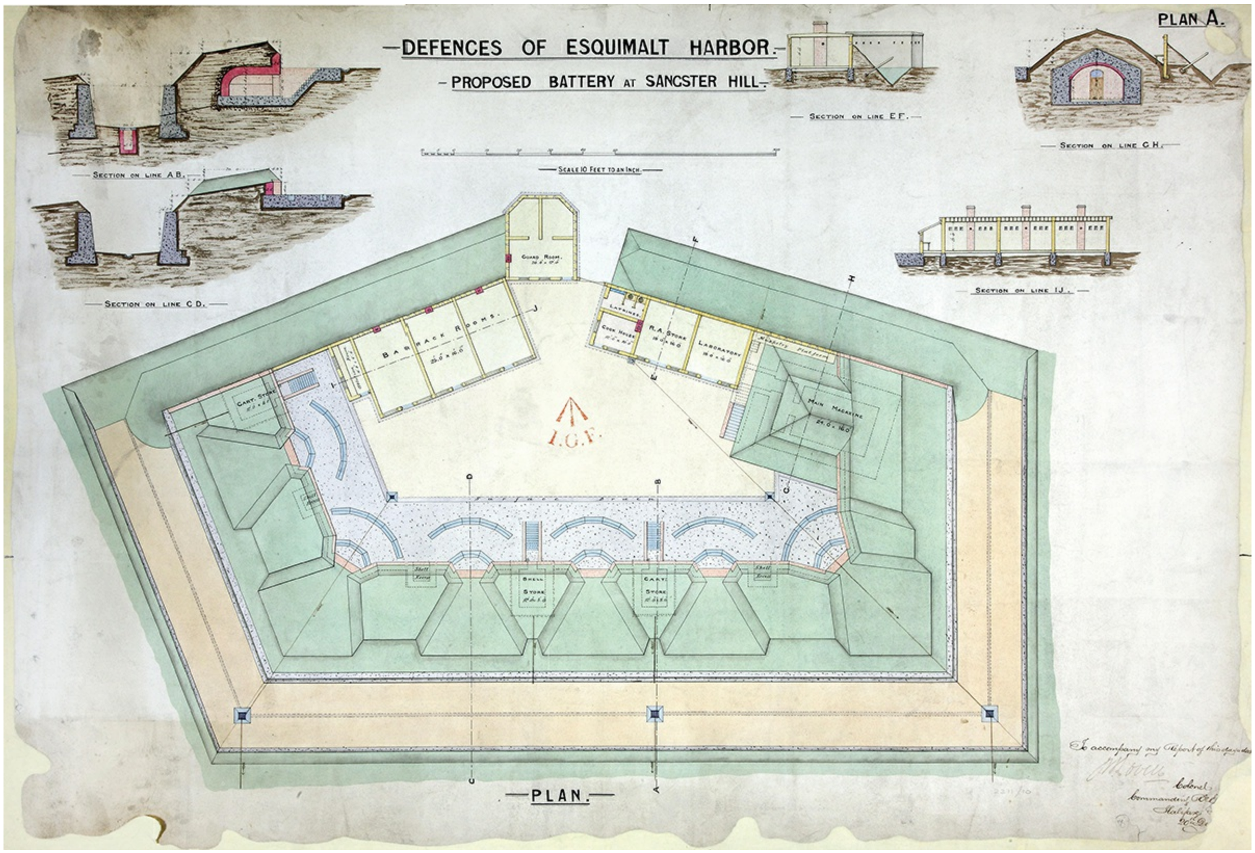
However, in 1912, the Turks used a line of fortifications and natural features at Chataldzha to halt a Bulgarian advance on Constantinople (Istanbul). The Bulgarian artillery had failed to destroy its Turkish counterpart, which blunted the Bulgarian infantry assault causing heavy losses. The power of entrenched positions supported by artillery when neither had been suppressed by superior offensive artillery was fully shown. But there was a general reluctance to take this lesson on board.


A Plan of the
TOWN
FORTIFICATIONS.
and
CITADEL
OF
ANTWERP.
5th SECTION
Lunette
2nd SECTION
3rd SECTION
4th SECTION
1st SECTION
Grand Basin
Little Basin
ESPLANADE
CITADEL
Military Arsenal
Place Verte
RIVER SCHELDT
North Fort
Fort Isabel
Tête de Flandre
Fort

ANTWERP, BELGIUM, 1832 The production of this plan of Antwerp's defences reflected interest in England arising from the conflict there. The fortifications included a concentric system of moats and bastions, a strong citadel and detached forts, notably on the other bank of the river Scheldt. Intervening in support of the Belgian revolution against Dutch rule, a French army under Marshal Gérard besieged the Dutch garrison which, based in the citadel, had been bombarding the rebellious town employing heated shot. The French successfully used a mortar bombardment to capture the citadel in 24 days.

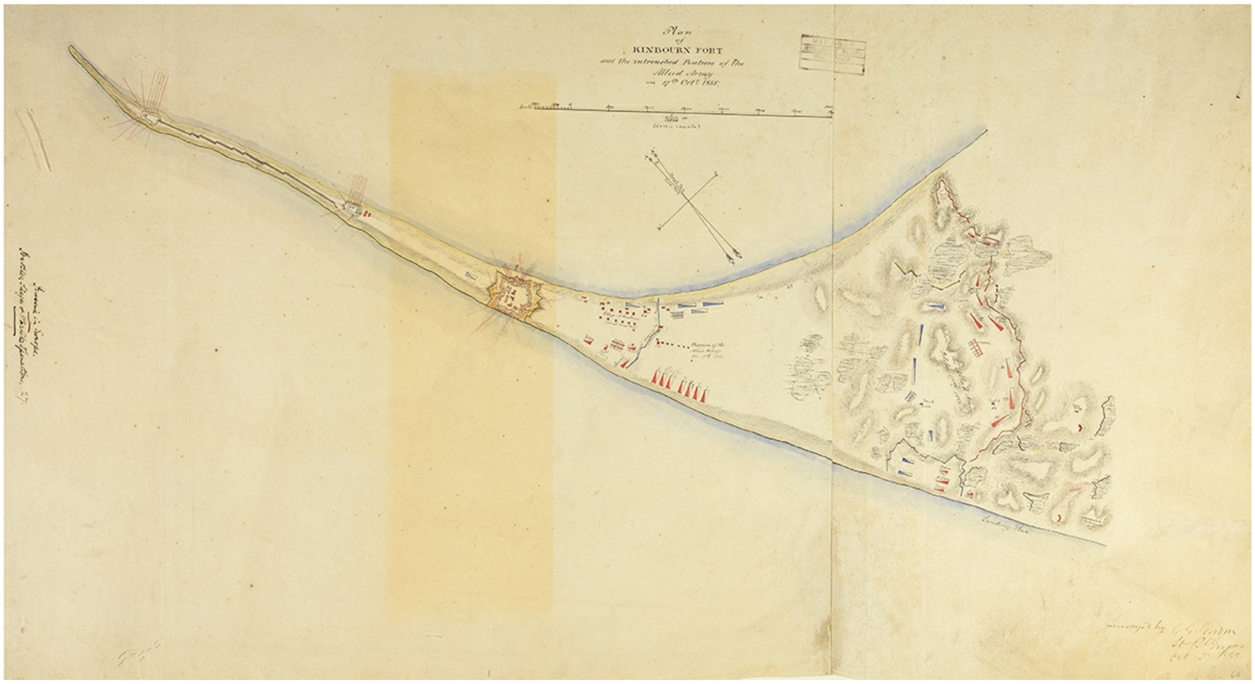

4149
7
ANTWERP.
OR ANVERS.
SCALE
1 Mile English
Railways thus
EGLISES
1 Notre Dame Cathedrale
2 St. Andre
3 . Charles
4 . Jacques
5 . Georges
6 Anglican
7 Protestante
ETABLISSEMENTS PUBLIQUE &c
8 Academe
9 Athenee
10 Arsenal de Construction
11 Bourse
12 . Anglicain
13 Cte. Belliard
14 Caserne St. Georges
15 . Predicateurs
16 . Gendarmerie
17 Consre. de Musique
18 Cille Halle
19 Ecole de Navigation
20 Gouvernement Provincial
21 Hangar des Vieux Lions
22 . Prussien
23 Hopital St. Elisabeth
24 . Louise Marie
25 Hospice Petites Soeurs
26 Jardin Botanique
27 Marche aux Poissons
28 Palais de Justice
29 Theatre Royal
30 . des Varietes
NOUVELLE ENCEINTE
(FORTIFICATIONS)
PORTE DE SCHYN
PORTE DE ERIDA
CHEMIN DE FER HOLLANDO BELGE
BORGERHOUT
JARDIN ZOOLOGIQUE
PARC
PORTE DE BORGERHOUT
STATION DE BERCHEM
PORTE DE BERCHEM
PORTE DE MALINES
FORTIN DE BERCHEM
BERCHEM
Hospice St. Marie
PEPINIERE
PORTE D'EDEGHEM
PORTE DE WILRYCK
ST. LAURENT
PORTE ST. LAURENT
PORTE DU KIEL
PORTE DE BOOM
KIEL
CIMETIERE DU KIEL
ESPLANADE
CITADELLE DU SUD
BASSIN DU CANAL
BASSIN DE LA CAMPINE
BASSIN AUX BOIS
GRAND BASSIN
PETIT BASSIN
BASSIN DU KATTENDYK
AVENUE DU COMMERCE
AVENUE DES ARTS
Place de la Victoire
SCAUT FLEUVE
CITADELLE DU NORD
Fort Isabelle
TETE DE FLANDRE

ANTWERP, BELGIUM, 1860 This map of Antwerp in 1860 illustrated the extension of the city and, therefore, of the new fortifications. In 1859, the 1815–18 and older fortifications were largely removed to make way for a new eight-mile-long wall, which was protected by a broad wet ditch and supported by eight detached forts. In the 1870s, the increased range and strength of artillery and the danger shown by the damaging German bombardment of Paris in 1871 led to the construction of a new, more distant line of forts.

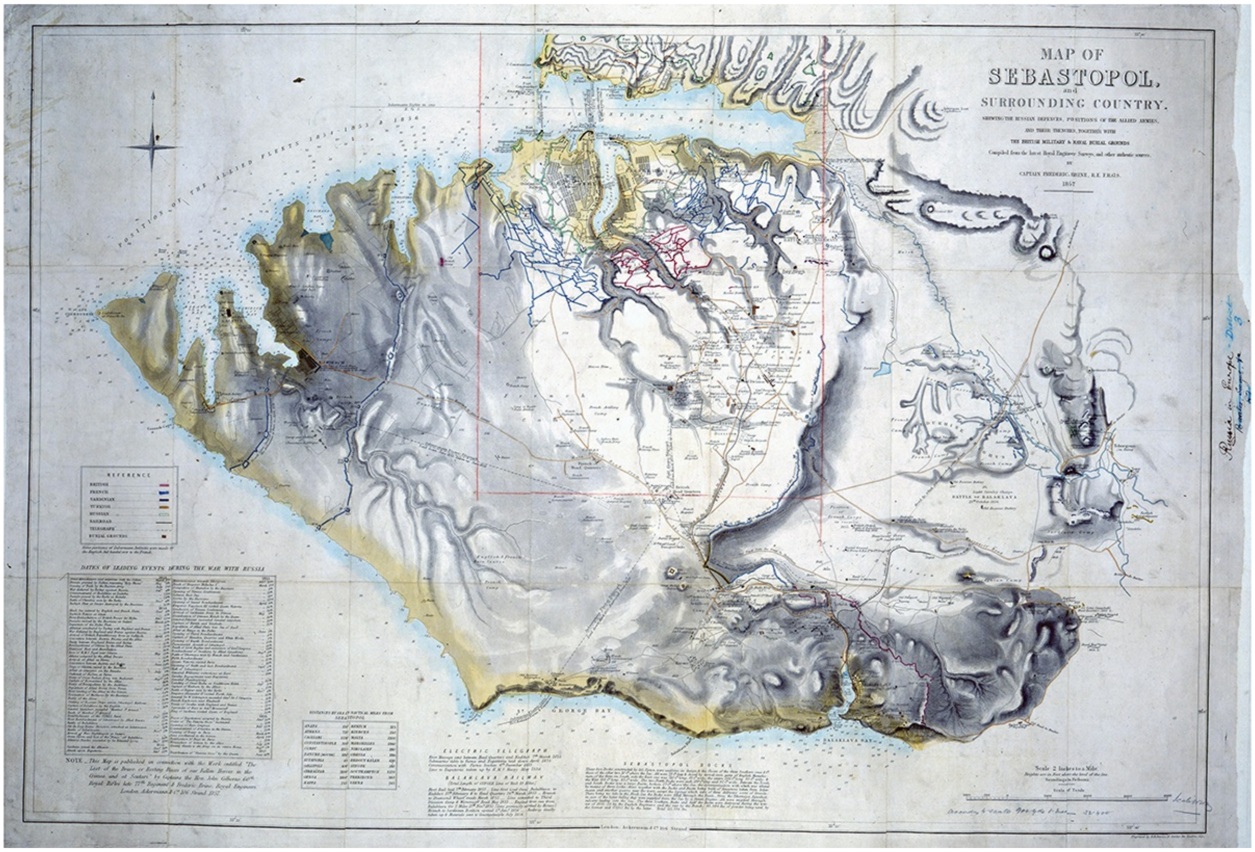

PLAN A.
DEFENCES OF ESQUIMALT HARBOR.
PROPOSED BATTERY AT SANGSTER HILL.
SECTION ON LINE A B.
SECTION ON LINE C D.
SECTION ON LINE E F.
SECTION ON LINE G H.
SECTION ON LINE I J.
SCALE 10 FEET TO AN INCH.
GUARD ROOM.
BARRACK ROOMS.
LATRINES.
COOK HOUSE.
R.A. STORE
LABORATORY
MAIN MAGAZINE
24.0 × 16.0
CART. STORE
SHELL STORE
CART. STORE
I.G.F.
PLAN.

ESQUIMALT, CANADA, DEFENCES The British dockyard on the Pacific seaboard of the Americas was opened at Esquimalt on Vancouver Island in 1842, eventually replacing a base in Valparaiso, Chile, as the home of the Royal Navy's Pacific Station. The opening was a move in the dispute with the United States over the Oregon question. The importance of the base was enhanced by concern over Russia's Pacific plans, concern heightened by the development of Vladivostok as a Russian naval base from 1860; the Royal Navy had operated across the Pacific against the Russians during the Crimean War of 1854–56. Until 1867, Alaska and the Aleutian Islands were Russian possessions. After the Arab-American Treaty of Washington of 1871 settled differences, the British withdrew their forces from Canada with the exception of the naval bases of Esquimalt and Halifax.

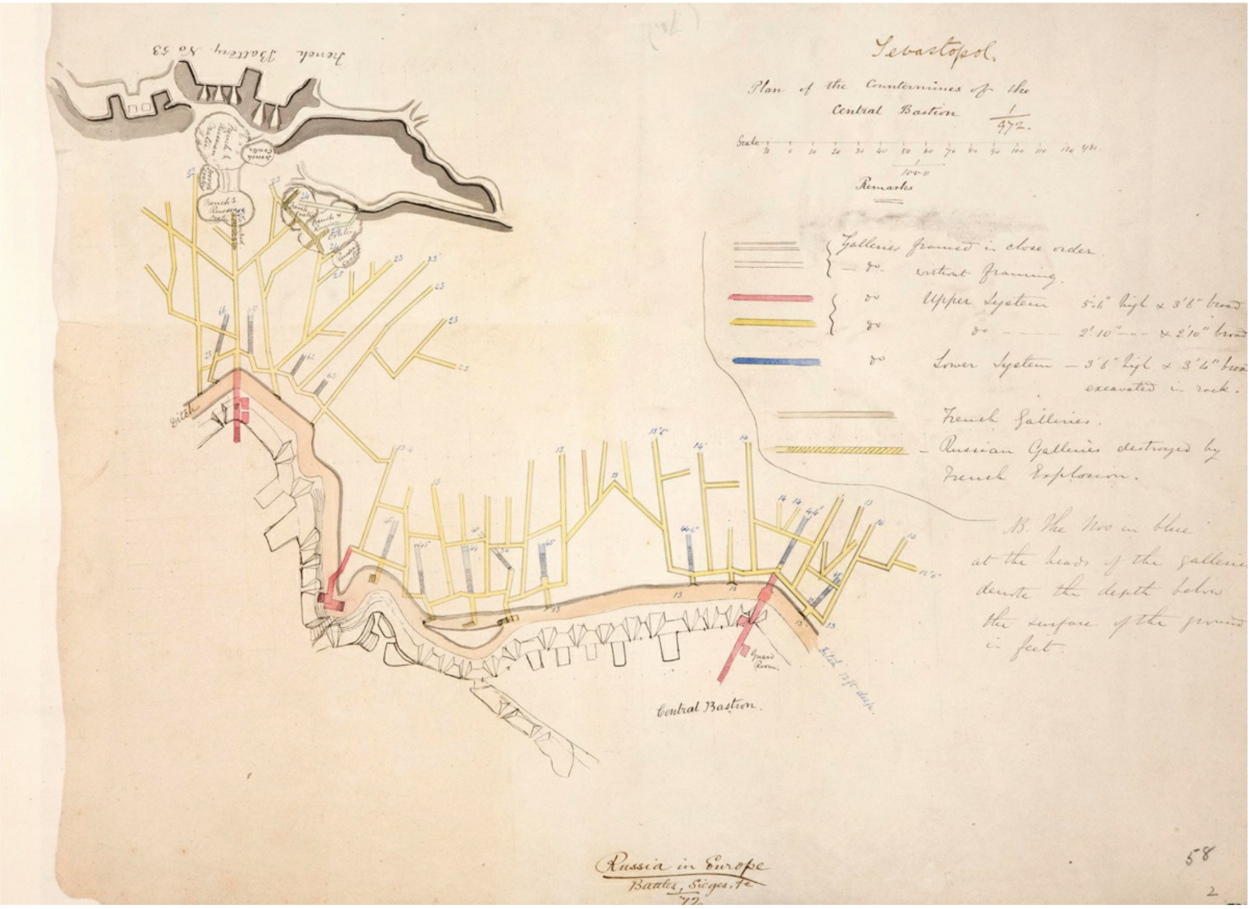
From 1878, the defences at Esquimalt were pressed forward in response to a war scare with Russia. It was decided to construct four batteries in order to provide protection for warships based there. Concern about Russian capability in the Pacific, was reflected in defences for the major ports of Australia. Moreover, in 1885, General Frederick Roberts, Commander-in-Chief in India, noted the vulnerability of British positions there.


Plan
of
KINBOURN FORT
and the entrenched Position of the
Allied Army
on 17th Octr 1855.

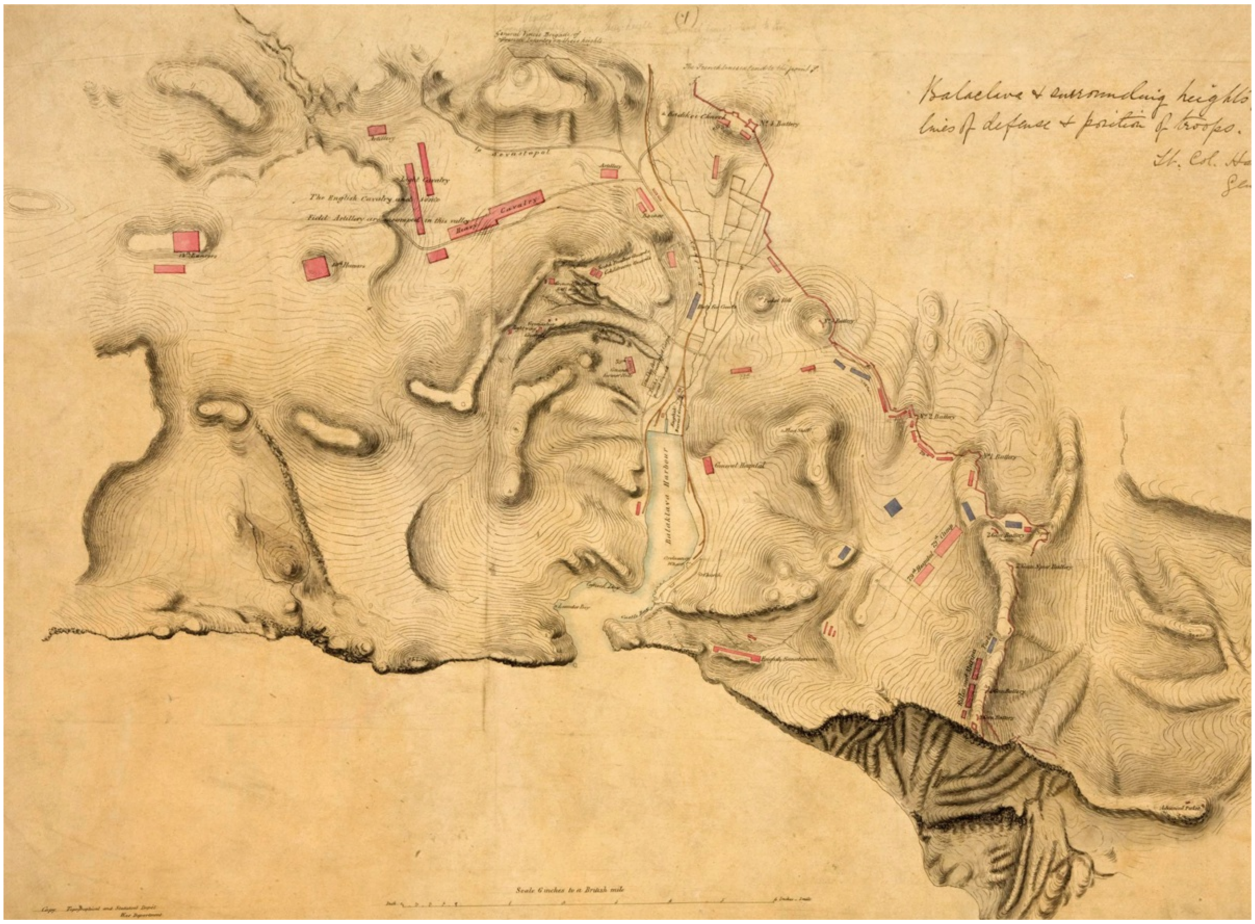
KINBURN, UKRAINE, 1855 Iron-plated wooden floating batteries were successfully used by the French when an Anglo-French squadron bombarded Kinburn on the Black Sea during the Crimean War. This led the British to order large numbers of screw gunboats and mortar boats, as well as iron-plated wooden floating shell batteries in preparation for an attack on Kronstadt and St Petersburg, but such an attack did not come in 1856 because the war ended. The French were encouraged in 1858 to lay down the *Gloire*, the first ironclad warship.


MAP OF
SEBASTOPOL,
and
SURROUNDING COUNTRY.
SHOWING THE RUSSIAN DEFENCES, POSITIONS OF THE ALLIED ARMIES,
AND THEIR TRENCHES, TOGETHER WITH
THE BRITISH MILITARY & NAVAL BURIAL GROUNDS
Compiled from the latest Royal Engineers Surveys, and other authentic sources.
BY
CAPTAIN FREDERIC BRINE, R.E. F.R.G.S.
1857
POSITION OF THE ALLIED FLEETS
REFERENCE
DATES OF LEADING EVENTS DURING THE WAR WITH RUSSIA
ELECTRIC TELEGRAPH
BALAKLAVA RAILWAY
SEBASTOPOL DOCKS

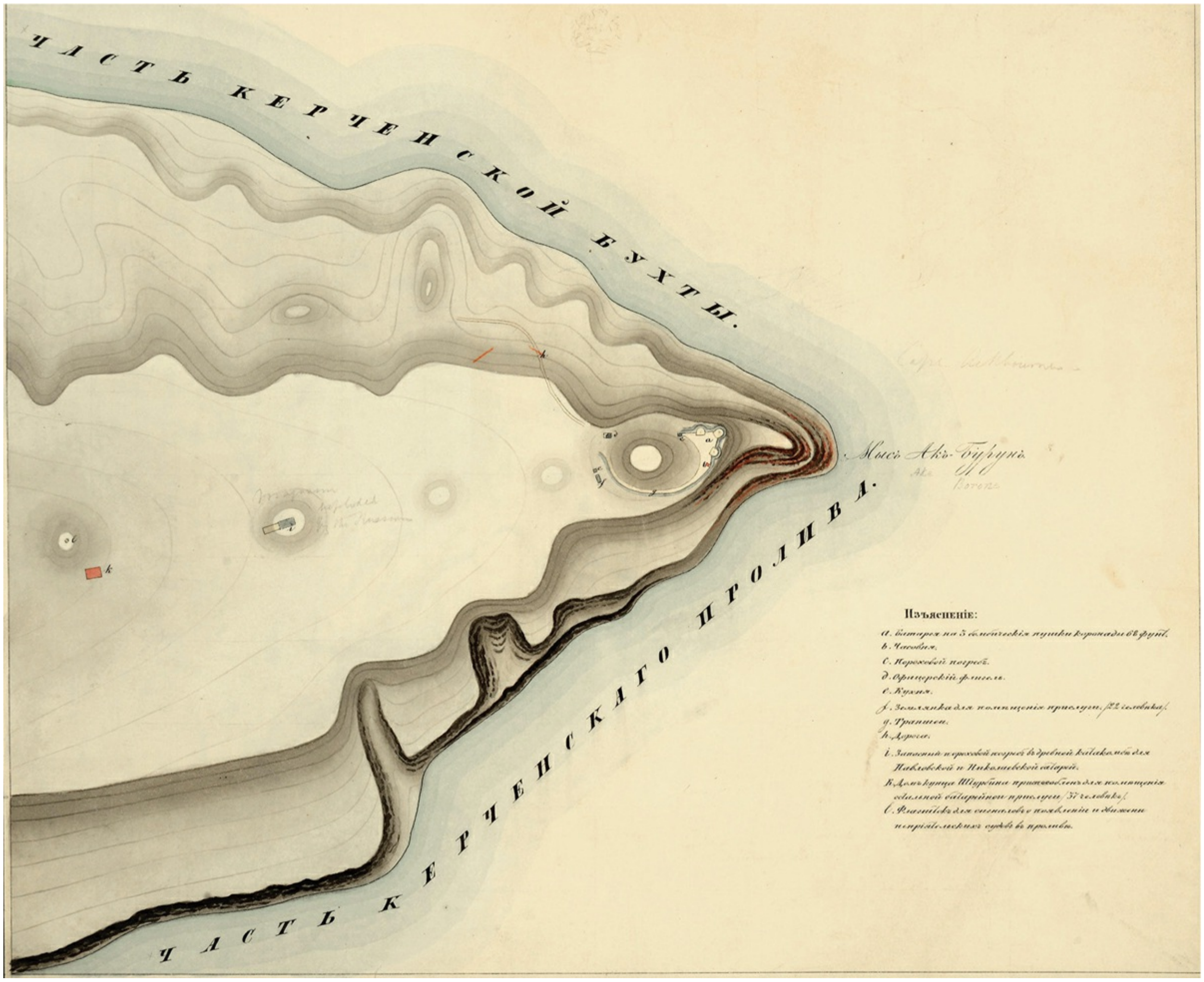
SEVASTOPOL, RUSSIA In the Crimean War (1854–56), the Anglo-French army sent to Crimea in 1854 surrendered mobility by besieging the Russian naval base of Sevastopol, which seemed the way to neuter the Russian naval threat to the Ottoman Empire. However, the siege was not fully effective as road links to the north of the port remained open – a consequence of the lack of sufficient Allied troops. The Allies also had to face both particularly bad weather, which hit supply links across the Black Sea, and attempts by the Russian army in Crimea to disrupt the siege. Despite heavy artillery support, Anglo-French land assaults in 1855 initially failed (as had a naval attack the previous year), for Sevastopol was well defended. Moreover, the attacking Allied armies lacked adequate experience in siegecraft and had to face a type of trench warfare. The Russian army was strongly entrenched outside the town, making able use of earth defences. In the end, Sevastopol fell in September 1855 after a successful French surprise attack on the Malakoff redoubt, a key position in the defences. Other Russian positions in Sevastopol were no longer tenable.


Sevastopol
Plan of the Countermines of the Central Bastion 1/472.
Scale
Remarks
Galleries framed in close order
— do without framing
do Upper System 5'6" high × 3'6" broad
do do 2'10" — × 2'10" broad
do Lower System — 3'6" high × 3'4" broad excavated in rock.
French Galleries.
— Russian Galleries destroyed by French Explosion.
N.B. The Nos in blue at the heads of the galleries denote the depth below the surface of the ground in feet.
French Battery No 53
Ditch
Guard Room
Central Bastion
Russia in Europe
Battles, Sieges, &c
72
58

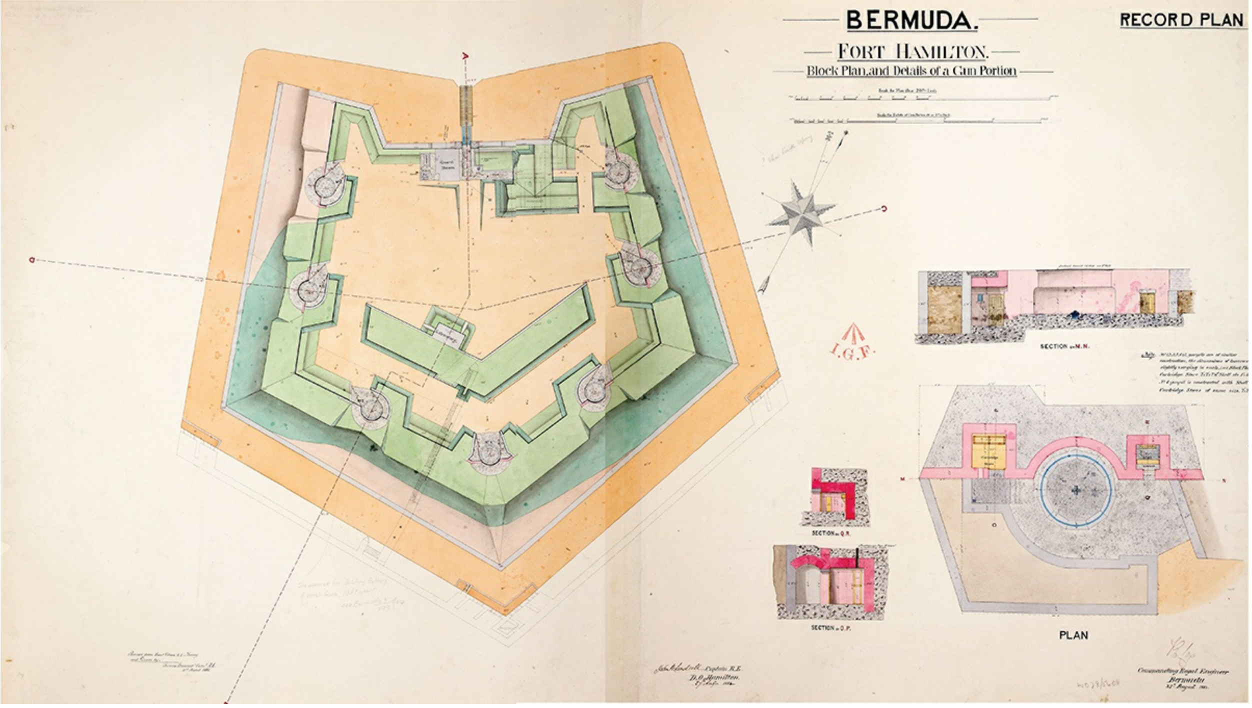
SEVASTOPOL, RUSSIA, 1855 This plan of the countermines of the central bastion shows the French-Russian struggle underground and the extent to which a long siege led to the accumulation of detailed information that could be mapped.


Balaclava & surrounding heights
lines of defense & position of troops.
Lt. Col. Ha
Balaklava Harbour
Scale 6 inches to a British mile

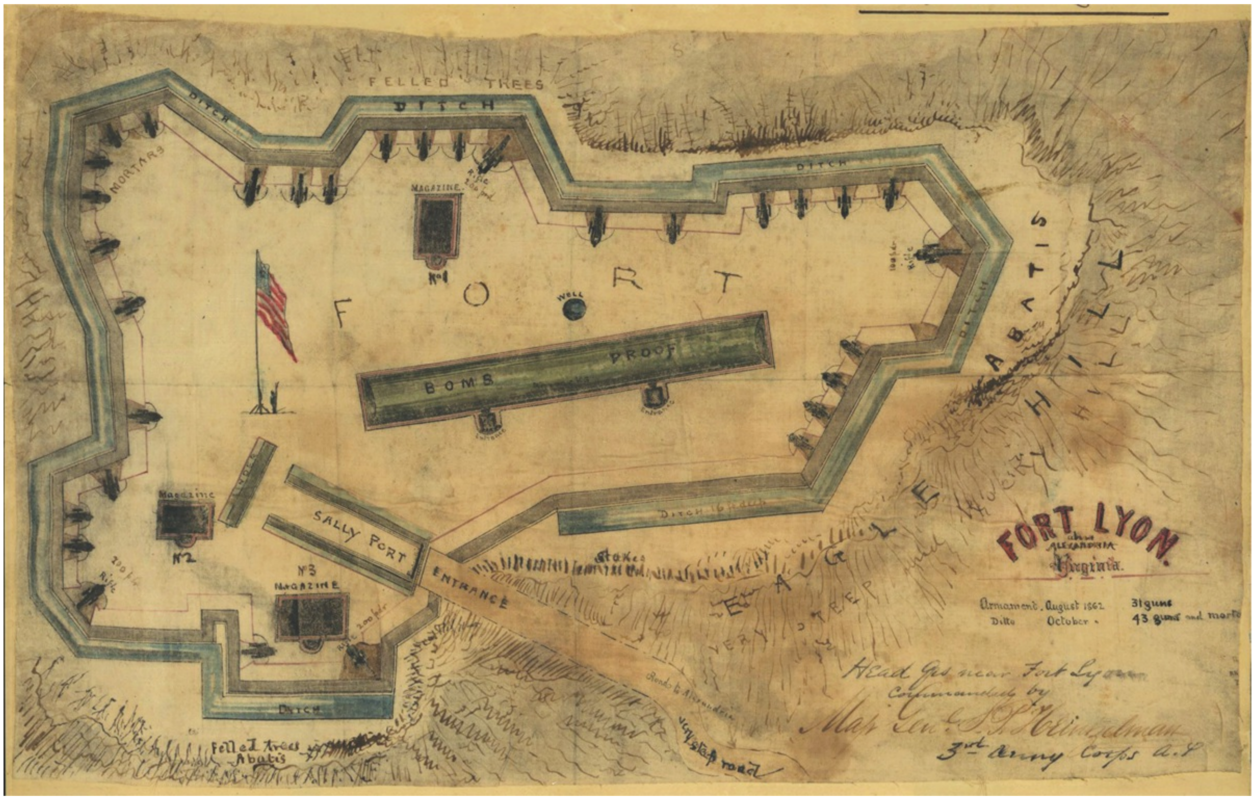
LINES OF DEFENCE AT BALACLAVA,RUSSIA, 1856 The Allies were dependent on supplies brought over the Black Sea and landed in Crimea, notably at Balaclava. As a result, the defences of that position were of considerable strategic as well as operational significance. These defences were a matter of fortifications and deployments, but it was also necessary to protect the route from there to the units outside Sevastopol, and this led to the battles of Balaclava and Inkerman.


Часть Керченской бухты.
Часть Керченскаго пролива.
Мысъ Акъ-Бурунъ.
Изъясненіе:
a. Батарея на 5 бомбическія пушки карронады 68 фунт.
b. Часовня.
c. Пороховой погребъ.
d. Офицерскій флигель.
e. Кухня.
f. Землянка для помещенія прислуги (22 человѣка).
g. Траншеи.
h. Дороги.
i. Запасный пороховой погребъ в древней катакомбѣ для Павловской и Николаевской батарей.
k. Домъ купца Шурбина приспособленъ для помещенія остальной батарейной прислуги (37 человѣкъ).
l. Флагштокъ для сигналовъ о появленіи и движеніи непріятельскихъ судовъ въ проливѣ.

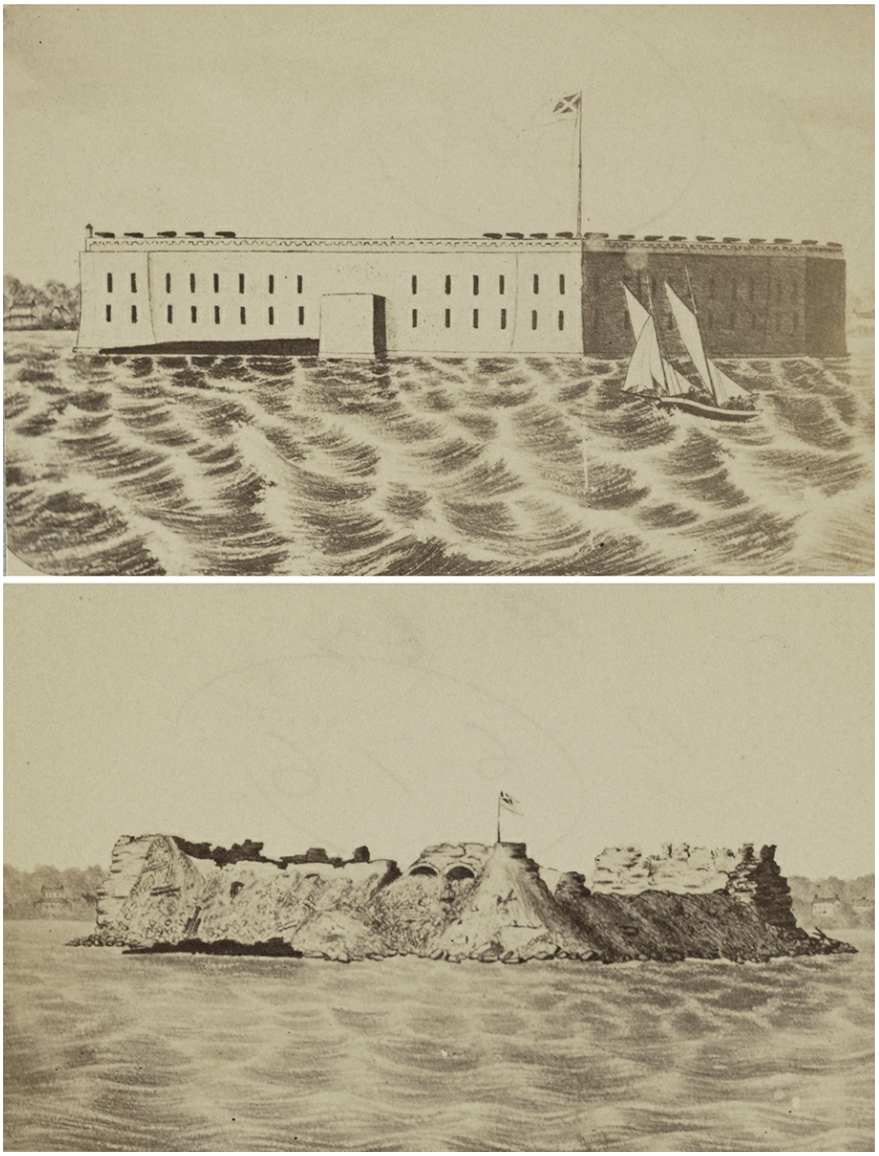
KERCH, RUSSIA, 1858 In 1855 when the British sent a large squadron to attack the Russian supply lines to Crimea through the Sea of Azov, the Russians abandoned the forts protecting the Straits of Kerch, and the British were able to devastate shipping in the sea. This illustration shows the defences at Cape Ak-Burun (White Cape) near Kerch, defences that focused on a battery at the cape armed with 20 guns. After the war, a major fortress was built there by the Russians.


BERMUDA.
RECORD PLAN
FORT HAMILTON.
Block Plan, and Details of a Gun Portion
I.G.F.
SECTION on M.N.
SECTION on Q.R.
SECTION on O.P.
PLAN

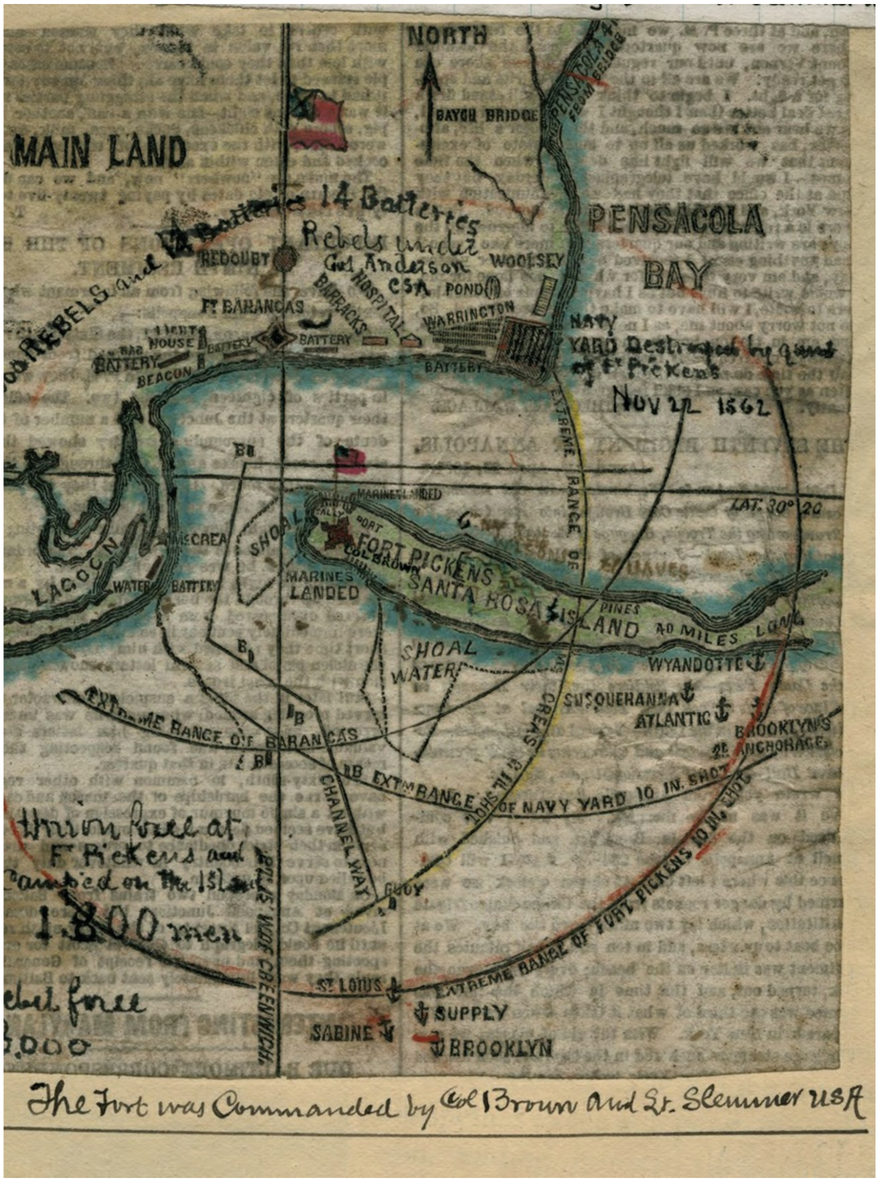
FORT HAMILTON, BERMUDA The prospect of a resumption of war between Britain and the United States escalated during the American Civil War (1861–65). Already, bad relations in the late 1840s had led to an upgrading of the defences of Bermuda. In November 1861, a crisis caused by the Trent Affair led to preparations for war, including the dispatch of reinforcements to Bermuda. The island's defences were upgraded as it would be both the base for any blockade of the United States and vulnerable to attack. Relations continued to be poor after the war until the Treaty of Washington (1871) greatly eased differences. Fort Hamilton was designed to protect Hamilton Harbour from an American invasion. It had a moat, underground passageways and powerful guns, but, like other masonry forts, it swiftly appeared obsolescent in the face of improvements in long-range gunnery, including stronger guns and more effective explosives.


FELLED TREES
DITCH
MORTARS
MAGAZINE
Nº1
FORT
WELL
BOMB PROOF
ABATIS
HILL
Magazine
Nº2
Nº3
MAGAZINE
SALLY PORT
ENTRANCE
EAGLE
VERY STEEP
Felled Trees
Abatis
Road to Alexandria
FORT LYON.
above
ALEXANDRIA
Virginia.
Armament, August 1862 31 guns
Ditto October " 43 guns and morta
Head Qrs near Fort Lyon
Commanded by
Maj Genl S. P. Heintzelman
3rd Army Corps A.P.

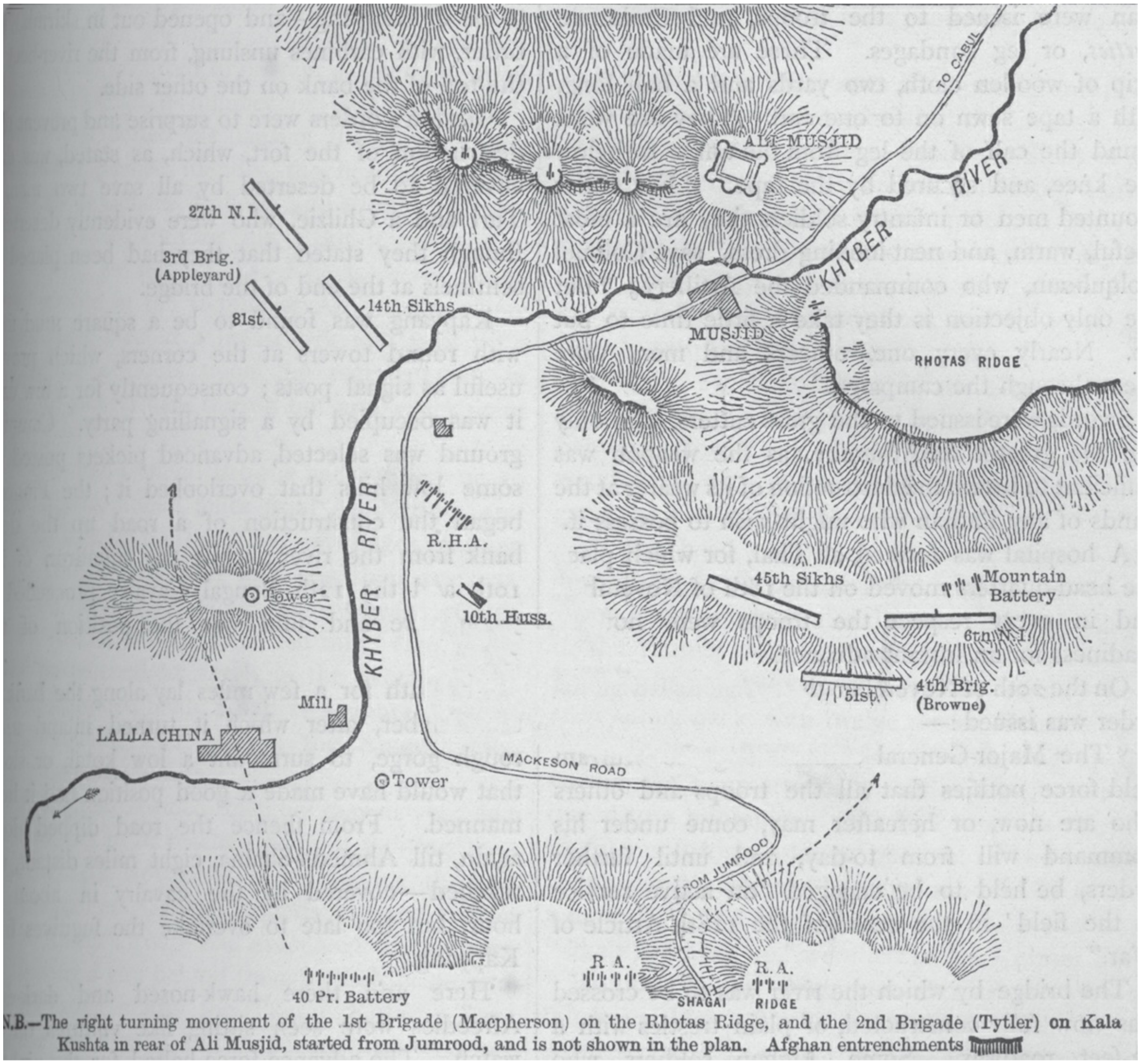
FORT LYON, UNITED STATES, 1862 This timber and earthwork fortification was constructed south of Alexandria, Virginia, as part of the Union defences of Washington. Covering nine acres and surrounded with abates and rifle pits, the fort had 31 guns. This map was produced by Robert Knox Sneden, a Union map draughtsman, in 1862. It shows the fort's defences in some detail. The active defence included a sally port for sorties. On 4 December 1861, the New York Times had infuriated the military by carrying on its front page 'The National Lines before Washington. A Map exhibiting the defences of the national capital, and positions of the several divisions of the Grand Union army.' The accompanying text referred to 'the principal permanent fortifications, which the rebels, if they attempt them, will find to be an impossible barrier.'



FORT SUMTER, UNITED STATES, 1861: BEFORE AND AFTER The bombardment of this fort in Charleston harbour began the American Civil War. The small Union garrison had been blockaded, but hostilities did not begin until the prospect of a Union relief fleet led on 12 April to a heavy bombardment. Hot shot cannonballs caused fires and the exhausted garrison surrendered next day.

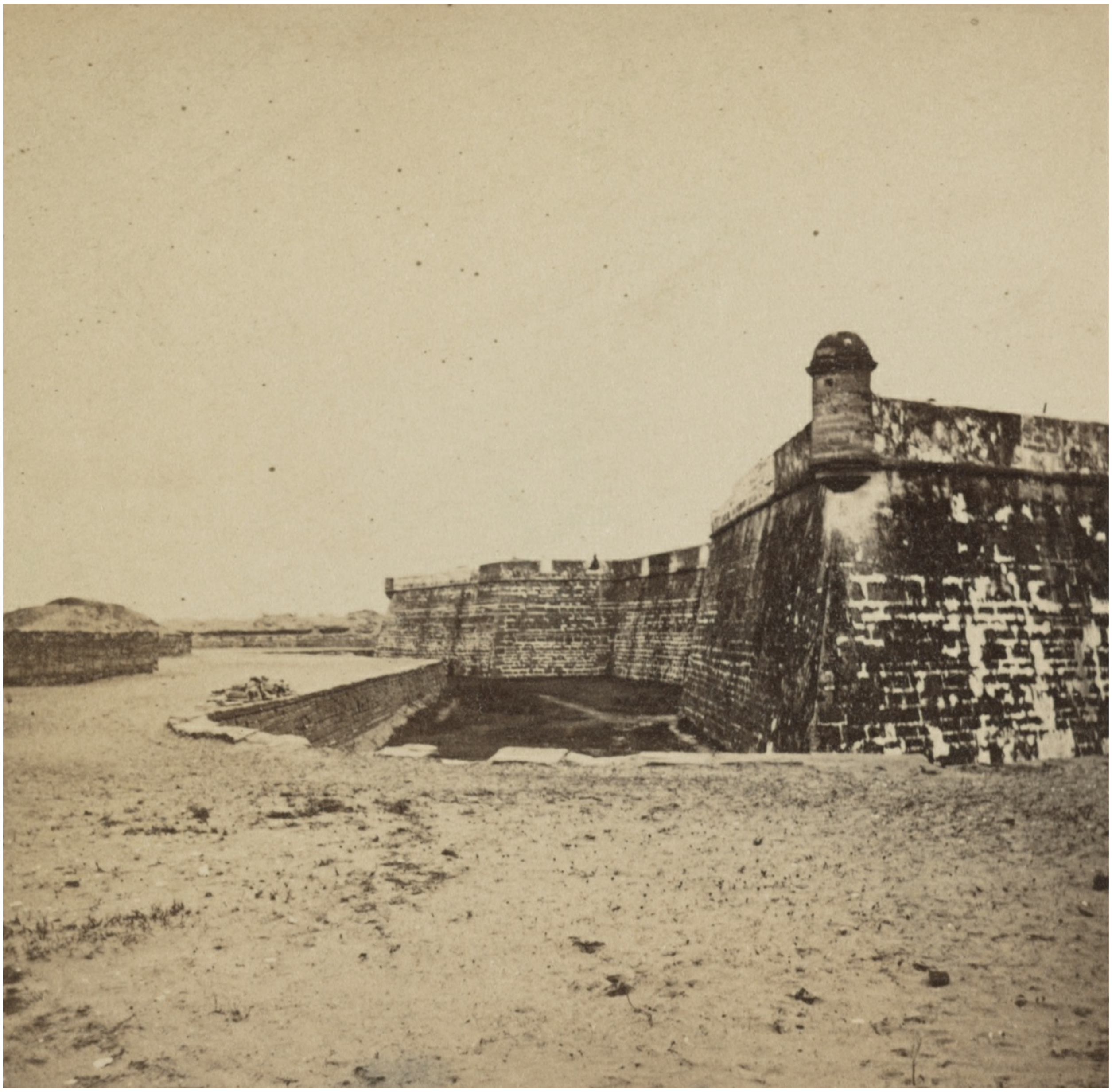

NORTH
BAYOU BRIDGE
PENSACOLA FROM BRIDGE
MAIN LAND
14 Batteries
Rebels under Col Anderson CSA
REDOUBT
FT BARANCAS
BARRACKS
HOSPITAL
WOOLSEY
POND
WARRINGTON
PENSACOLA BAY
LIGHT HOUSE
BATTERY
BATTERY
BAG BATTERY
BEACON
BATTERY
NAVY YARD Destroyed by guns of Ft Pickens
Nov 22 1862
EXTREME RANGE OF MCCREAS
LAT. 30° 20
MARINES LANDED
SALLY PORT
FORT PICKENS
COL BROWN
SANTA ROSA ISLAND 40 MILES LONG
PINES
ZOUAVES
SHOAL
MCCREA
LAGOON
WATER BATTERY
MARINES LANDED
SHOAL WATER
WYANDOTTE
SUSQUEHANNA
ATLANTIC
BROOKLYN'S 2D ANCHORAGE
EXTREME RANGE OF BARANCAS
EXT RANGE OF NAVY YARD 10 IN. SHOT
CHANNEL WAY
BUOY
87°15' WEST GREENWICH
Union force at Ft Pickens and camped on the Island 1800 men
Rebel force 8,000
EXTREME RANGE OF FORT PICKENS 10 IN. SHOT
ST LOUIS
SUPPLY
SABINE
BROOKLYN
The Fort was Commanded by Col Brown and Lt. Slemmer USA

FORT PICKENS, UNITED STATES Built 1829–34, largely by slaves, on Santa Rosa Island off Pensacola Bay, the fort was not in use during the 1850s and suffered from a fire in 1858. However, in January 1861, the fort was seen by the local Union commander as the most readily defended local position. The other positions were abandoned and the fort held by the Union throughout the war, being subsequently provided with long-range gun batteries from the 1890s. This map shows the range of guns from and against the island during the American Civil War.

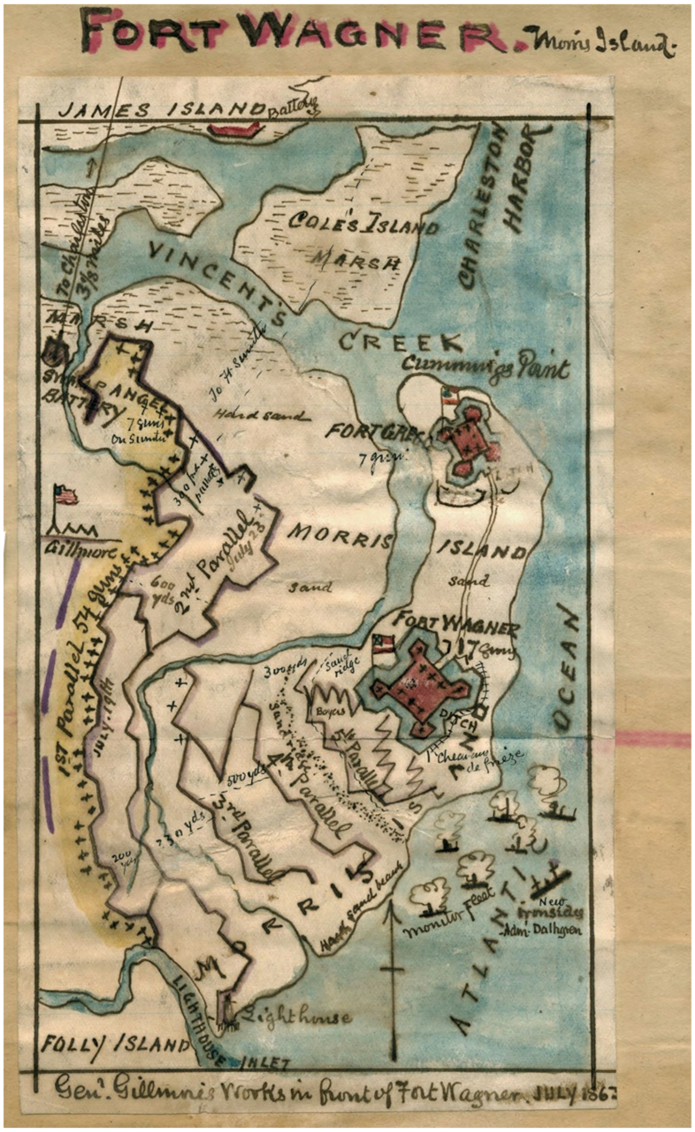

TO CABUL
ALI MUSJID
KHYBER RIVER
27th N.I.
3rd Brig.
(Appleyard)
14th Sikhs
81st.
MUSJID
RHOTAS RIDGE
R.H.A.
KHYBER RIVER
Tower
10th Huss.
45th Sikhs
Mountain Battery
6th N.I.
51st.
4th Brig.
(Browne)
Mili
LALLA CHINA
MACKESON ROAD
Tower
FROM JUMROOD
40 Pr. Battery
R.A.
R.A.
SHAGAI
RIDGE

N.B.—The right turning movement of the 1st Brigade (Macpherson) on the Rhotas Ridge, and the 2nd Brigade (Tytler) on Kala Kushta in rear of Ali Musjid, started from Jumrood, and is not shown in the plan. Afghan entrenchments ▥

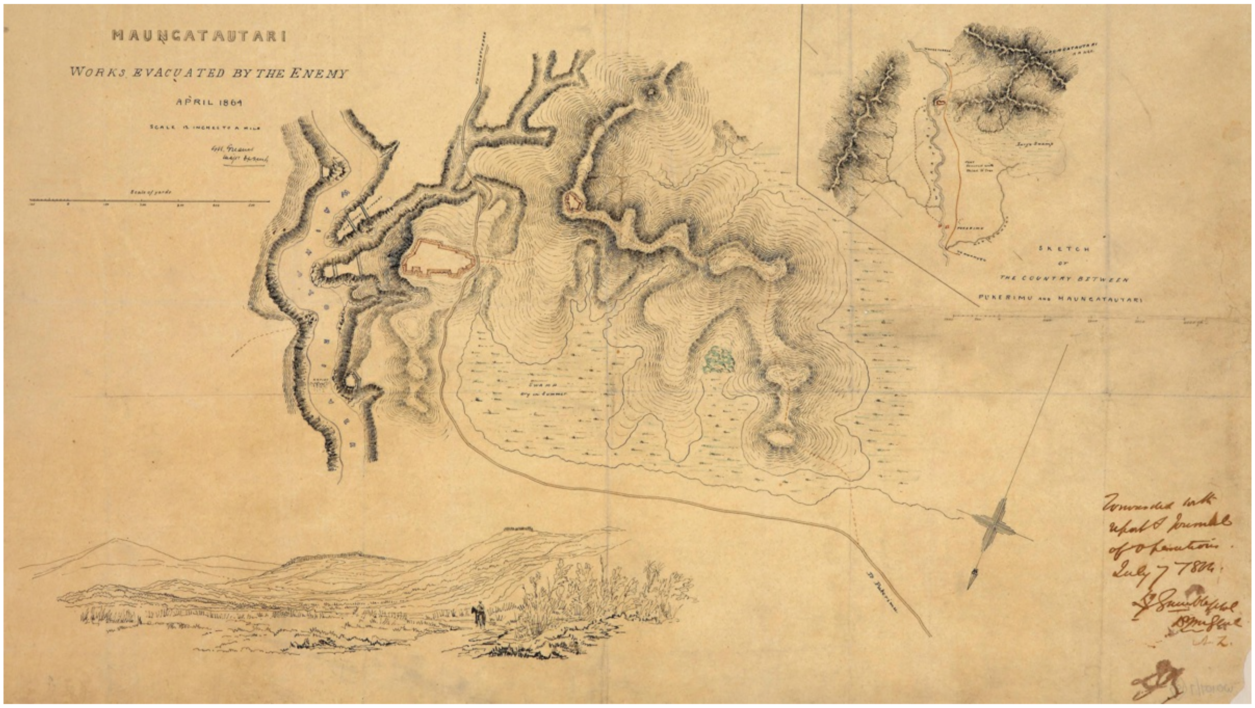
PLAN OF THE ATTACK ON ALI MASJID, AFGHANISTAN On a commanding position at the narrowest point of the Khyber Pass, the mud brick fort was built in 1837 as part of the Afghan attempt to protect their position against the expansionism of the Sikh ruler Ranjit Singh, who had annexed Peshawar. The fort was taken by the British in 1839, evacuated in 1842 during the first Anglo-Afghan War and then captured on 21 November 1878 after a difficult fight in the opening stage of the Second Anglo-Afghan War. The British stormed the Afghan entrenchments on Rhotas Ridge and to the rear of Ali Masjid, and then captured the fort, the Afghans falling back.



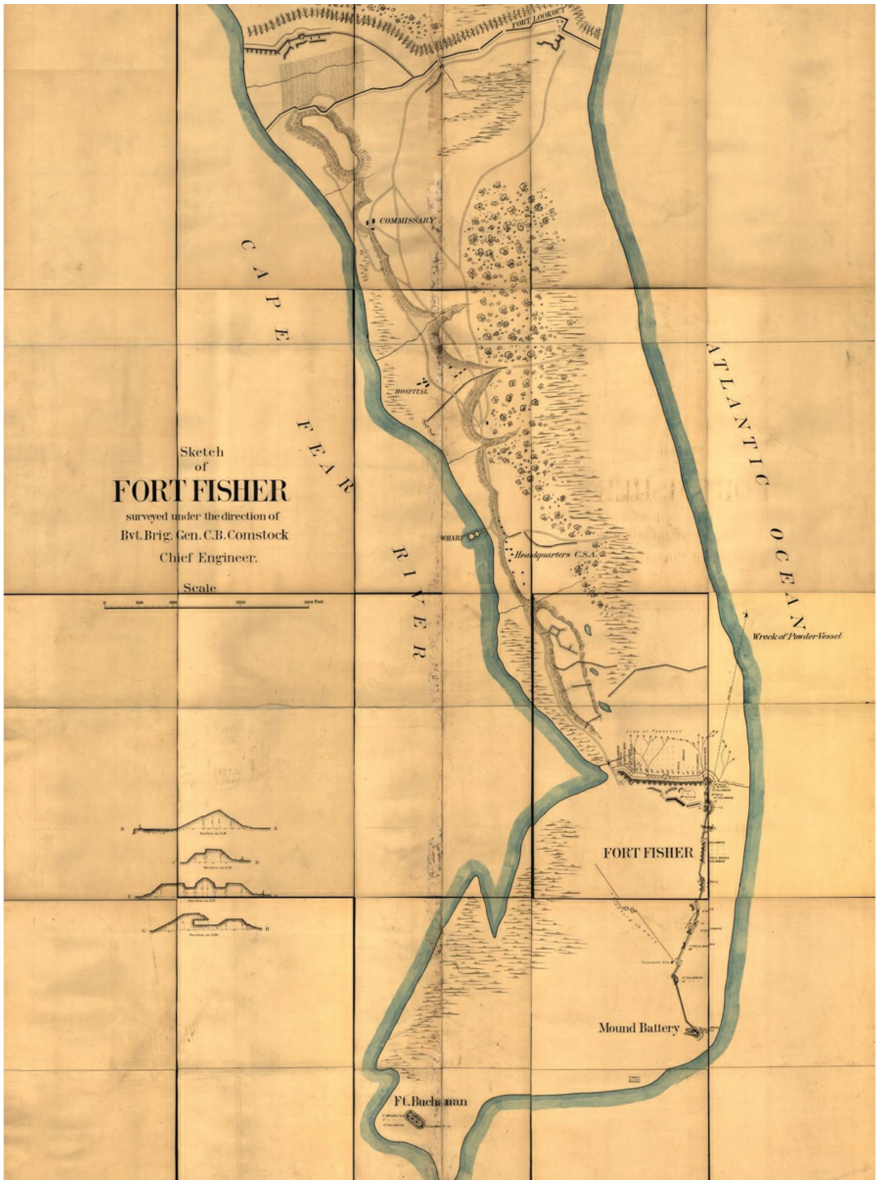
FORT MARION, ST AUGUSTINE, FLORIDA, PHOTOGRAPHED BETWEEN 1861 AND 1865 Originally the Spanish-built Castillo de San Marcos had a moat surrounding a bastioned polygon. Few structural changes were made by the Americans, most significantly the filling in of part of the moat. During the American Civil War, the fort was seized by Confederate forces in 1861, and regained by the Union in March 1862 as the result of the arrival of the Union fleet. No shot was fired on either occasion.


FORT WAGNER. Morris Island.
JAMES ISLAND Battery
To Charleston 3¾ miles
COLE'S ISLAND MARSH
CHARLESTON HARBOR
VINCENT'S CREEK
MARSH
Cummings Point
FORT GREGG
7 guns
To Ft Sumter
Hard sand
SWAMP ANGEL BATTERY
7 guns On Sumter
340 feet parallel
2nd Parallel July 23
600 yds
Gillmore
1st Parallel 57 guns
July 19th
MORRIS ISLAND
sand
FORT WAGNER 17 guns
sand ridge
300 yds
Boyces
5th Parallel
4th Parallel
DITCH
Chevaux de frise
500 yds
3rd Parallel
220 yds
200 yds
Hard sand beach
Monitor fleet
New Ironsides
Adm. Dahlgren
ATLANTIC OCEAN
Lighthouse
FOLLY ISLAND
LIGHTHOUSE INLET
Genl. Gillmore's Works in front of Fort Wagner. JULY 1863

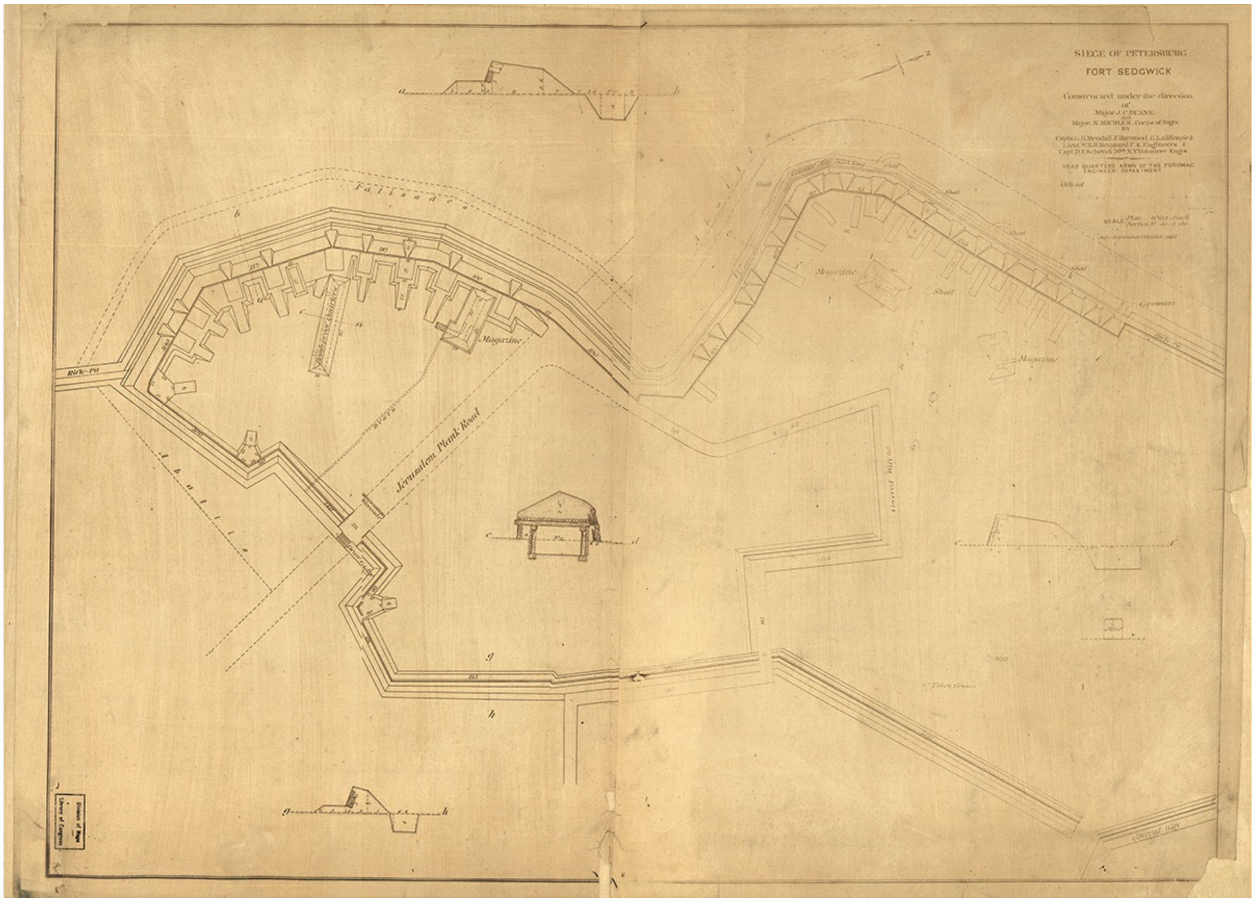
FORT WAGNER, UNITED STATES, 1863 In 1863, the Union forces under the energetic Quincy Adams Gillmore, supported by the South Atlantic Blockading Squadron under the determined Rear-Admiral John Dahlgren, sought to capture Fort Wagner on Morris Island, in order to gain a position from which to attack Charleston. Union assaults in July were repelled with heavy casualties. This led Gillmore, as shown in this map, to begin formal siege operations with earthworks getting successively closer to the fort. The Confederates were exposed to heavy bombardment and also faced logistical problems. On 7 September, the Confederates evacuated the position.


MAUNGATAUTARI
WORKS EVACUATED BY THE ENEMY
APRIL 1864
SCALE 15 INCHES TO A MILE
Scale of yards
Large Swamp
PUKERIMU
SKETCH
OF
THE COUNTRY BETWEEN
PUKERIMU AND MAUNGATAUTARI

MAORI FORTIFICATIONS AT MAUNGATAUTARI, WAIKATO RIVER, NORTH ISLAND, NEW ZEALAND, 1864 The Maoris used well-sited trench and *pa* (fort) systems that were difficult to bombard or storm, and these posed serious problems for the British in the 1860s. However, the British prevailed against the Waikato in 1863–64, deploying more troops. Fort building and the use of allied Maori force also helped.


FORT LOOKOUT
COMMISSARY
CAPE FEAR RIVER
HOSPITAL
Sketch of FORT FISHER surveyed under the direction of Bvt. Brig. Gen. C.B. Comstock Chief Engineer.
Scale
WHARF
Headquarters C.S.A.
ATLANTIC OCEAN
Wreck of Powder Vessel
FORT FISHER
Mound Battery
Ft. Buchanan

FORT FISHER, NORTH CAROLINA, 1865 A Confederate stronghold built during the Civil War to protect the port at Wilmington, Fort Fisher became more significant as other forts were captured. Built largely of earth, the fort was effective at absorbing shot. The fort was protected against both sea and land attack, with 49 mounted guns. In 1864, Fort Buchanan was added at the furthest tip of the peninsula. A Union expedition in December 1864 failed, but the following month, covered by bombardment from 56 ships, 10,000 troops were landed and the smaller Confederate force was defeated. Cyrus Comstock, an engineer who was Grant’s senior aide-de-camp, was sent to serve on the second expedition. He was responsible for this plan, which includes four cross-sections of ramparts.

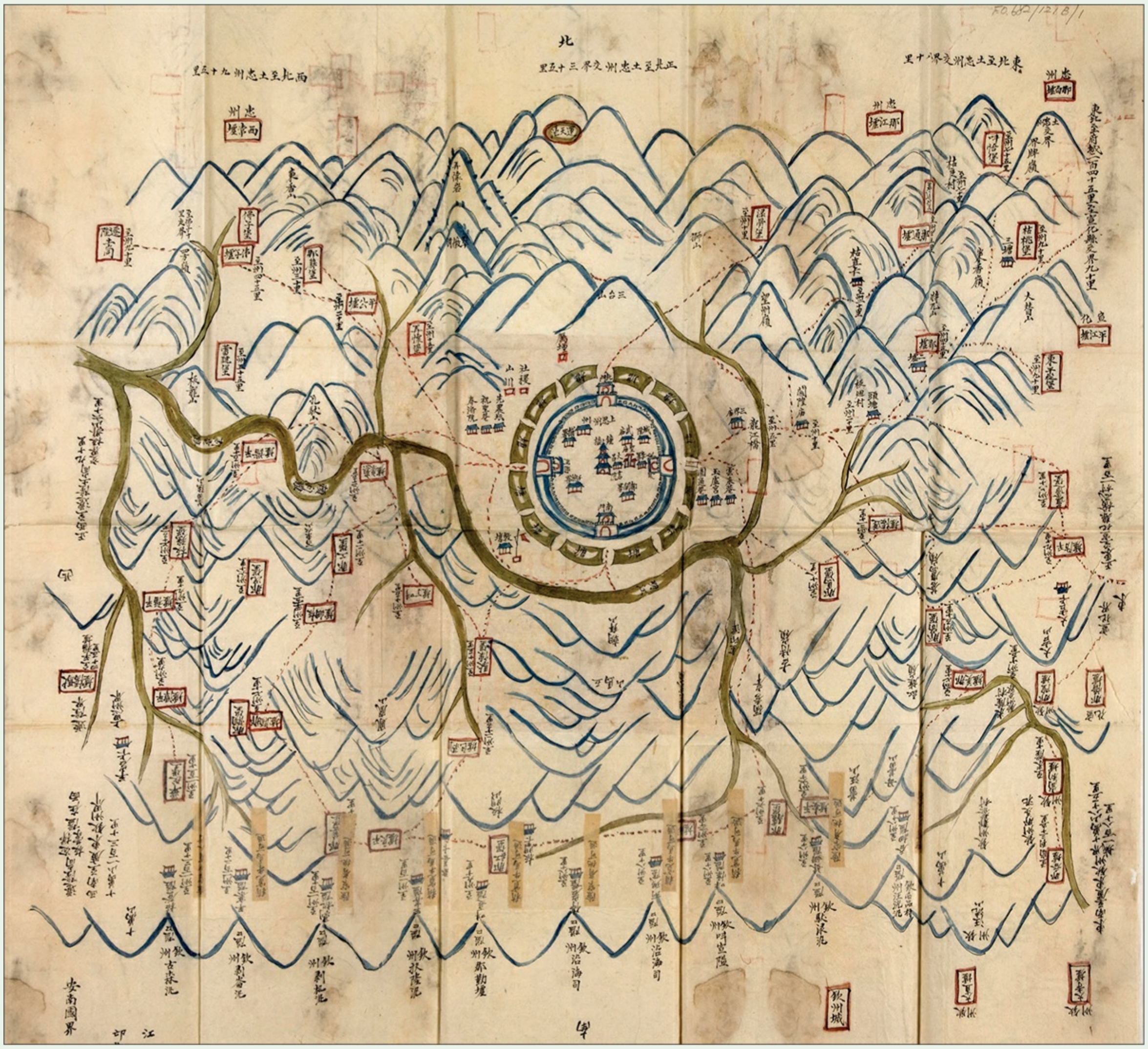

SIEGE OF PETERSBURG
FORT SEDGWICK
Constructed under the direction of
Major J. C. DUANE
and
Major N. MICHLER, Corps of Engrs
BY
Capts. G. H. Mendell, F. Harwood, G. L. Gillespie &
Lieut. W. H. H. Benyaurd U. S. Engineers &
Capt. D. F. Schenck 50th N. Y. Volunteer Engrs
HEAD QUARTERS ARMY OF THE POTOMAC
ENGINEER DEPARTMENT
Official
SCALE
July, September, October, 1864
Palisades
Abatis
Rifle Pit
Magazine
Jerusalem Plank Road
Covered Way
Shaft
Caponniere
Division of Maps
Library of Congress

FORT SEDGWICK, UNITED STATES, 1864–65 This is a detailed Union plan of the fort with cross-sections. Fort Sedgwick was established near Petersburg, Virginia, in July 1864 and named after a Union general. The fort blocked the Jerusalem Plank road into Petersburg and exchanged fire with the nearby Confederate Fort Mahone. Fort Sedgwick provided supporting artillery fire in the unsuccessful July 1864 assault on the Confederate lines. Its remains were covered by a shopping mall in 1967.

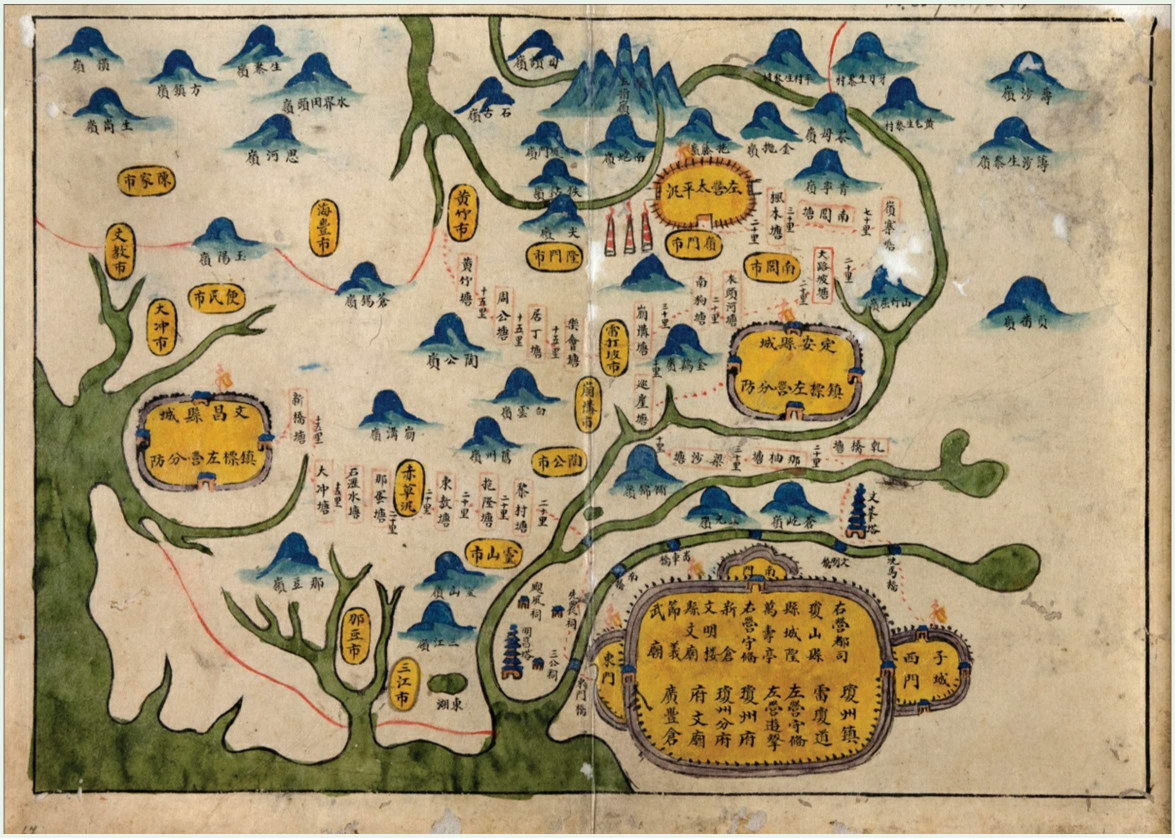
CHINESE FORTIFICATIONS

By the standards of Western commentators, Chinese fortifications might appear limited, even primitive. However, they generally worked well in order to enforce the presence of the state and notably when opposed to rebellions, such as the White Lotus rebellion of 1796–1805. Although Chinese positions, including the Pearl (Zhu) River forts, fell to the British in 1842, in the First Opium War, the British found the Dagu forts at the mouth of the Peiho (Hai) river a difficult target in 1859 in the Second Opium War; the earthen fortifications absorbed British shot. In 1860, however, a fresh attack by a larger Anglo-French force led to the fall of the Dagu forts, after which the force advanced to occupy Beijing.

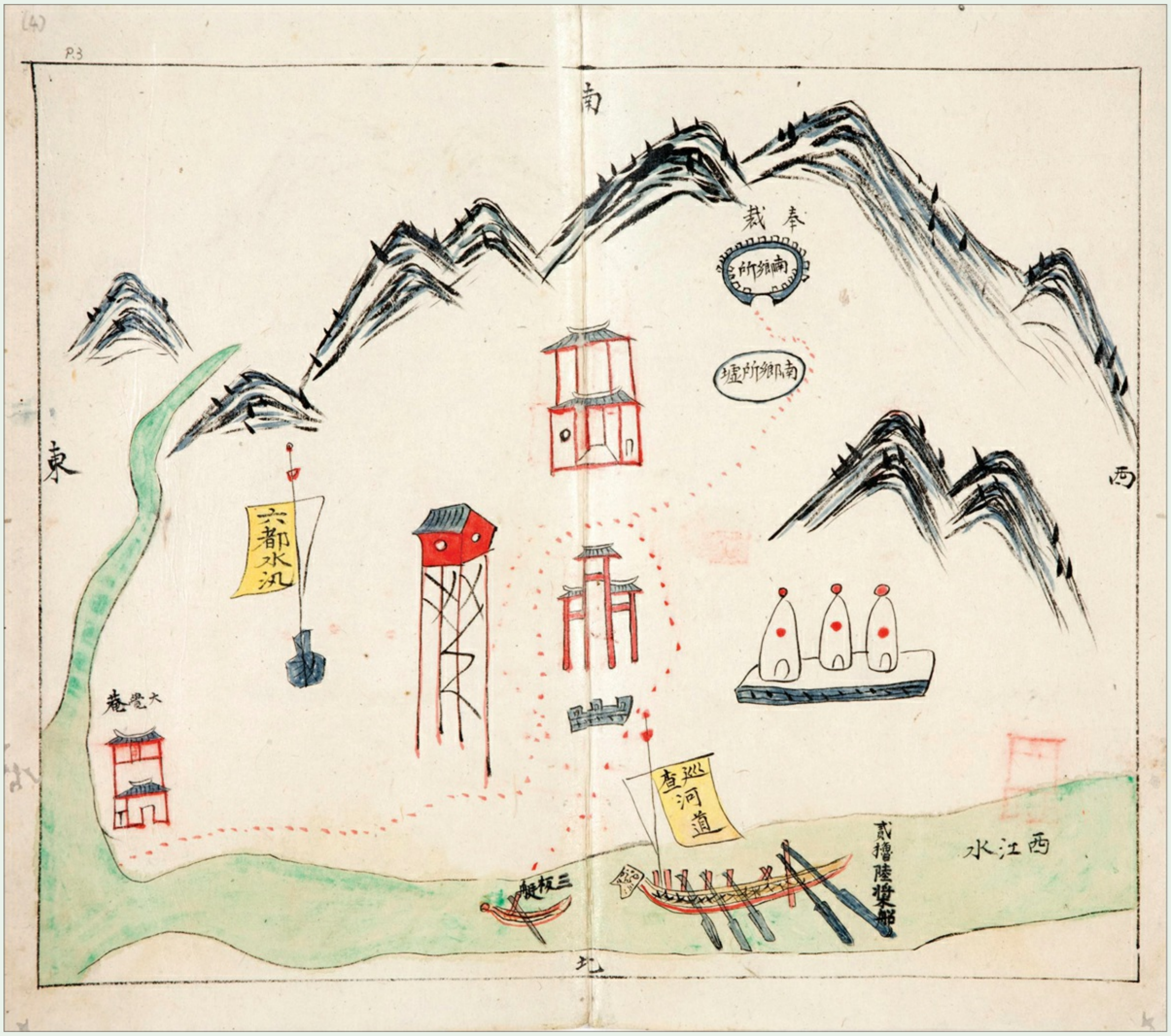
In the Taiping rebellion of 1851–66, fortifications were again significant. About three-quarters of a million Taiping troops took the major city of Nanjing in 1853. Mines created breaches in the wall through which the outer city was stormed, and human wave attacks carried the inner city’s walls. In 1860 and 1862, however, Taiping attempts to take Shanghai were blocked by Anglo-French firepower, and in 1864 Nanjing was recaptured from the Taiping. There was no significant change in Chinese fortifications during the century.


北
西北至土忠州九十五里
正北至土忠州交界三十五里
東北至土忠州交界八十里
安南國界
欽州城

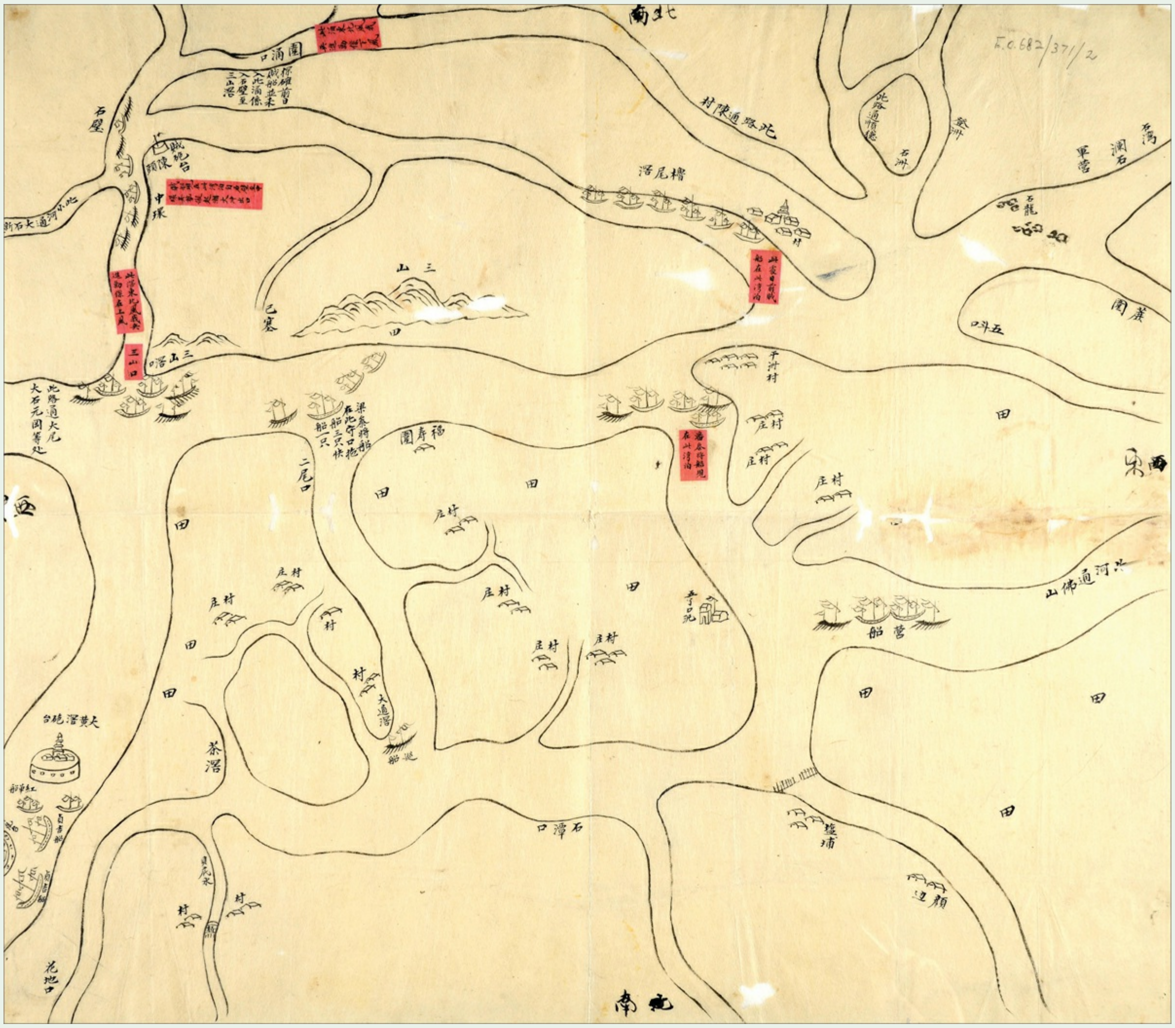
SHANG-SSU CHOU IN SOUTHERN KWANGSI, CHINA 1850S.


文昌縣城
鎮標左營分防
定安縣城
鎮標左營分防
左營太平汛
瓊州鎮
雷瓊道
左營守備
左營遊擊
瓊州府
瓊州分府
府文廟
廣豐倉
右營都司
瓊山縣
縣城隍
萬壽亭
右營守備
新倉
文明樓
縣文廟
節義
武廟
東門
西門
南門
子城
文峯塔
明昌塔
陳家市
文教市
海豈市
黄竹市
便民市
大冲市
隆門市
嶺門市
南閭市
雷打坡市
崩溝市
陶公市
赤草汛
臺山市
那豆市
三江市
東湖
黄竹塘
周公塘
居丁塘
樂會塘
新橋塘
大冲塘
石湿水塘
那蛋塘
東敖塘
抱隆塘
黎村塘
崩溝塘
迎塵塘
南狗塘
木頭河塘
楓木塘
南閭塘
大路坡塘
乾橋塘
那柚塘
翠沙塘
十五里
二十里
三十里
七十里
嶺寨塘
嶺
生黎嶺
方鎮嶺
水界田頭嶺
生尚嶺
思河嶺
玉陽嶺
蒼錫嶺
陶公嶺
崩溝嶺
白雲嶺
萬州嶺
那豆嶺
三江嶺
石古嶺
五指嶺
南蛇嶺
金鷄嶺
蒼屹嶺
青亭嶺
茶母嶺
金抱嶺
薄沙嶺
薄沙生黎嶺
貢黃嶺
平村生黎村
才日生黎村
黄色生黎村
先農祠
三公祠
颶風祠
文明橋
南橋
東門橋

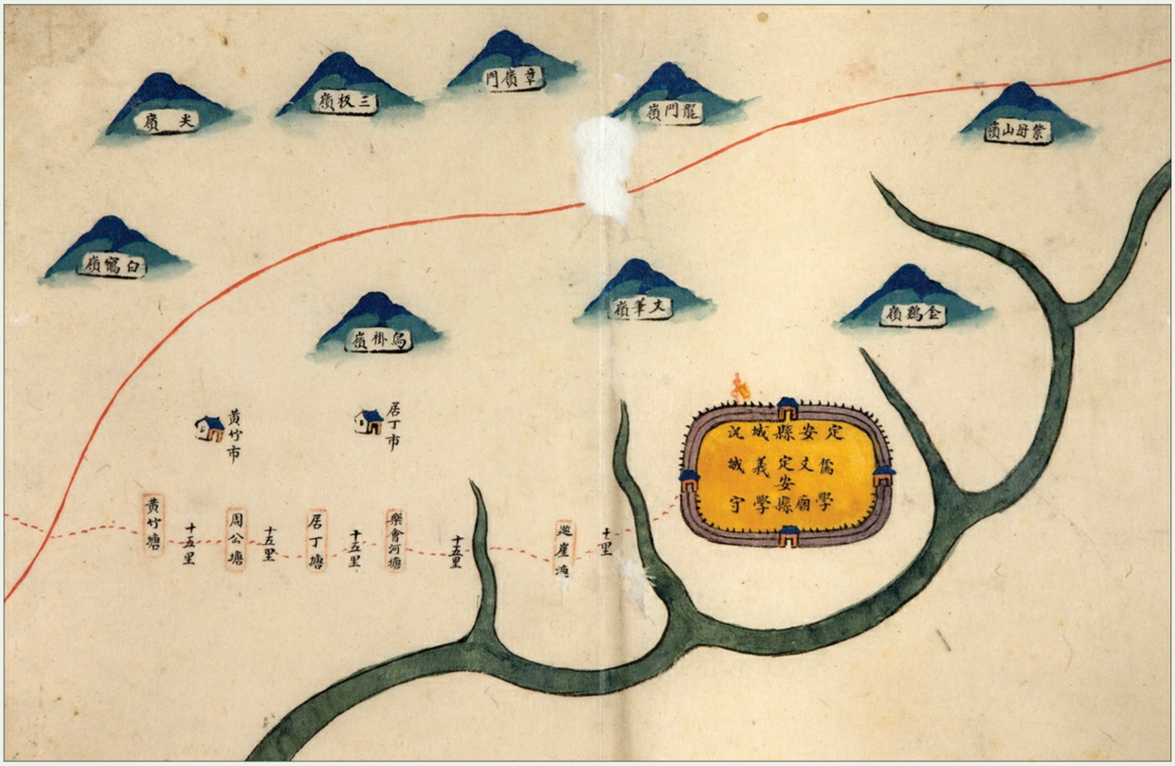
MILITARY MAP OF THE COASTAL AREA AND SEA AT CHIN-NANG, CHINA 1850S.


南
東
西
北
奉裁
南鄉所
南鄉所墟
六都水汛
大覺庵
巡查河道
三板艇
貳櫓陸槳船
西江水

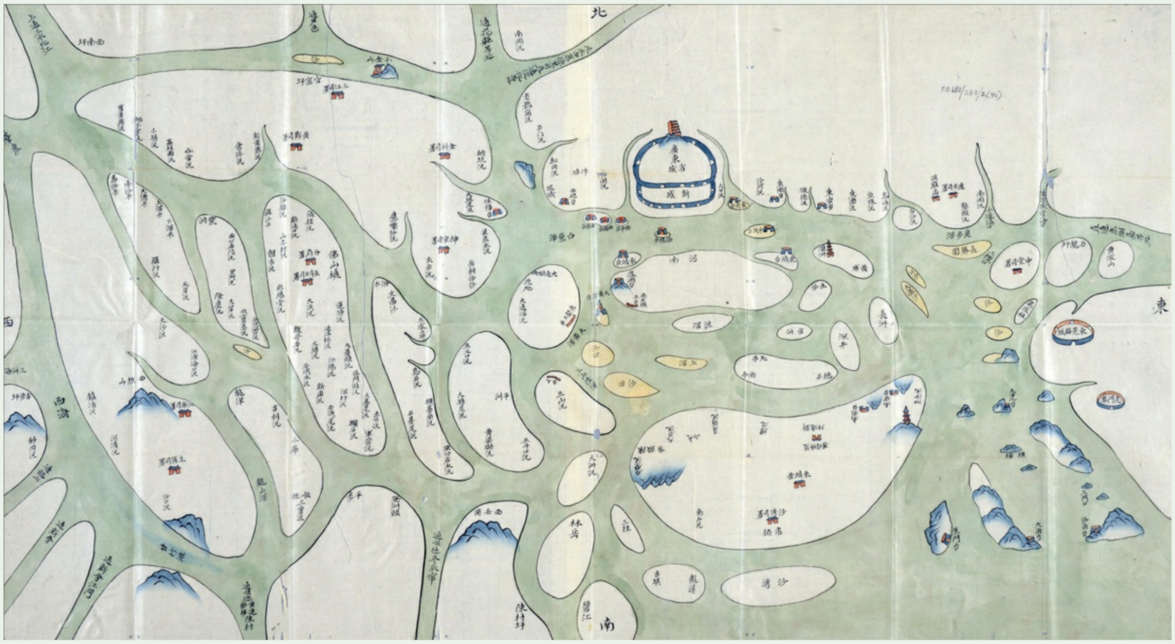
MILITARY POSTS IN TUNG-AN DISTRICT, CHINA 1850S.


北
南
西
F.O. 682/371/2
圍涌口
北路通陳村
槽尾滘
北小河通大石新
石壁
中環
三山
三山滘
三山口
此路通大尾大石元岡等處
福壽園
二尾口
平洲村
庄村
五斗口
石龍
石洲
北河通佛山
營船
田
茶滘
石灣口
花地口
大黃滘砲台

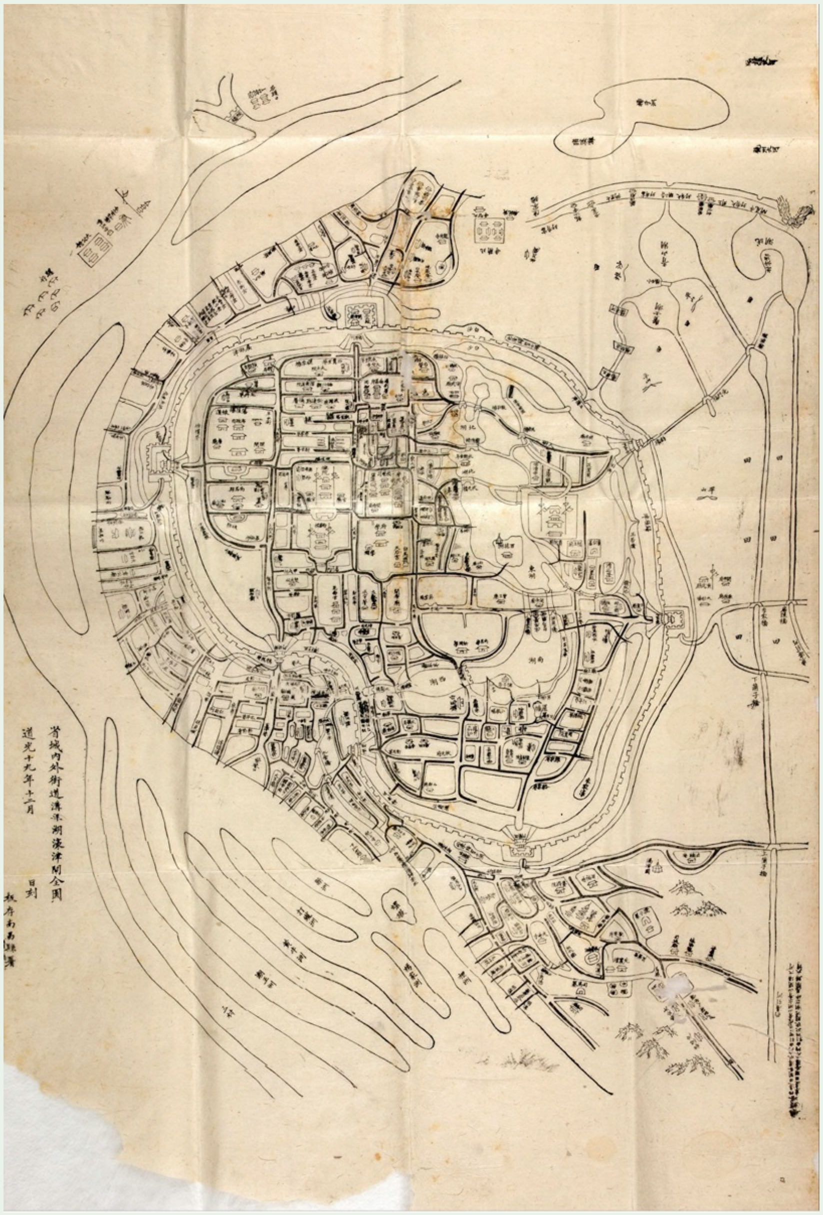
THE PEARL RIVER BELOW CANTON, CHINA, SHOWING THE POSITION OF GOVERNMENT AND REBEL FORCES 1850S.


夫嶺
三杈嶺
龍門嶺
白鶴嶺
烏桁嶺
文筆嶺
金雞嶺
黃竹市
居丁市
定安縣城汎
黃竹塘
十五里
周公塘
十五里
居丁塘
十五里
樂會河塘
十五里
十里

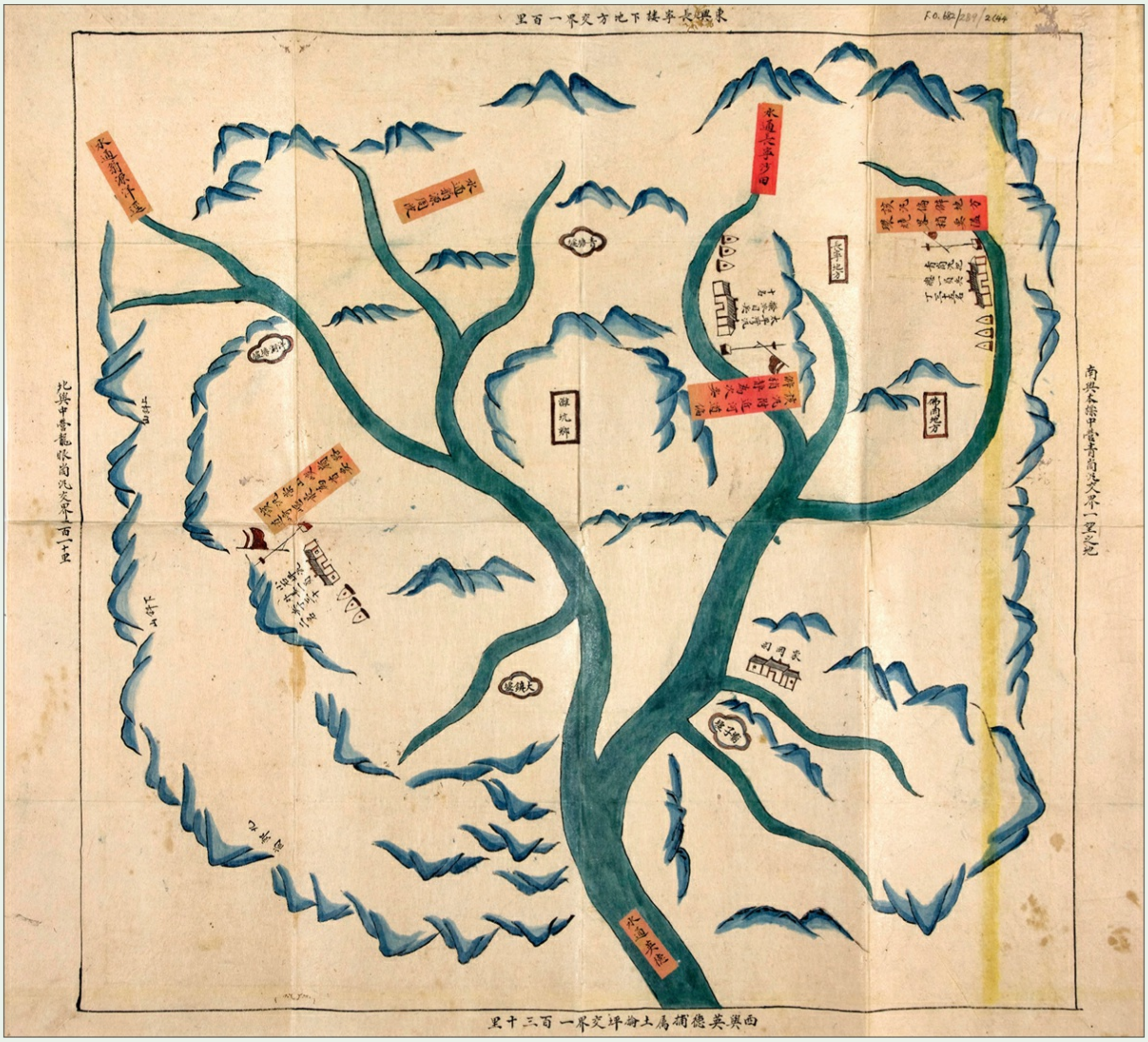
MILITARY MAP OF AREA AT THE CONFLUENCE BETWEEN TUNG-CHIANG AND THE PEARL RIVER WHICH WAS DEFENDED BY THE KWANGTUNG WATER FORCE, CHINA 10 MARCH 1857.



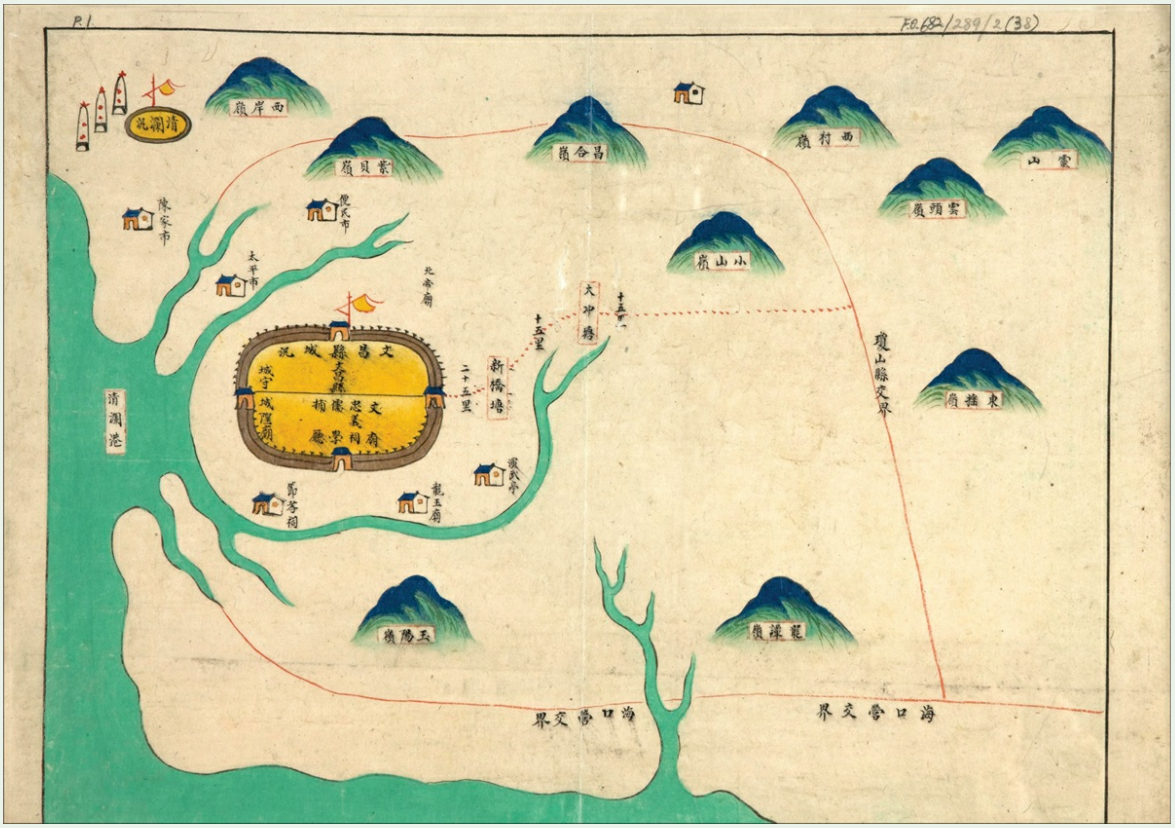
MILITARY MAP OF JU-YUAN AND ENVIRONS, CHINA 1850S.


省城内外街道溝渠湖濠津閘全圖
道光十九年十二月 日刻
板存南兩縣署

T'AI-P'ING-LI MILITARY POST, CHINA UNDATED.


東與長亭接下地方交界一百里
西與英德補屬土崙坪交界一百三十里
北與中營龍脉崗汎交界一百一十里
南與本縣中營青崗汎交界一里之地
F.O. 682/289/2(44)
水通長亭沙田
長亭地方
灘坑鄉
佛岡地方
水通英德

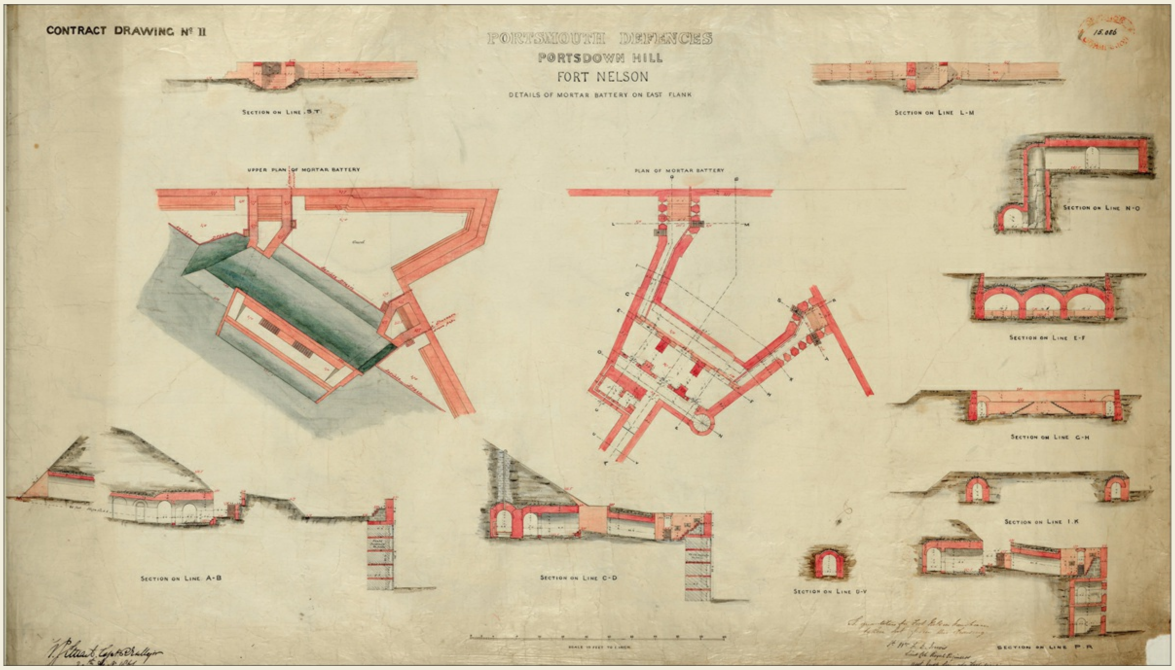
NOTES ON SHIH-P'AI-KANG FORT, 30 LI NORTH OF LIN-KAO, HAI-NAN ISLAND, CHINA.


P.1
F.O.682/289/2(38)
清瀾汛
西岸嶺
紫貝嶺
昌合嶺
西村嶺
雲山
雲頭嶺
小山嶺
陳家市
便民市
太平市
北帝廟
文昌縣城汛
文昌縣
城守
城隍廟
文廟
忠義祠
儒學
捕廳
大沖塘
新橋塘
十五里
二十五里
十五里
瓊山縣交界
東擂嶺
清瀾港
節孝祠
龍王廟
演武亭
玉陽嶺
龍灘嶺
海口營交界
海口營交界

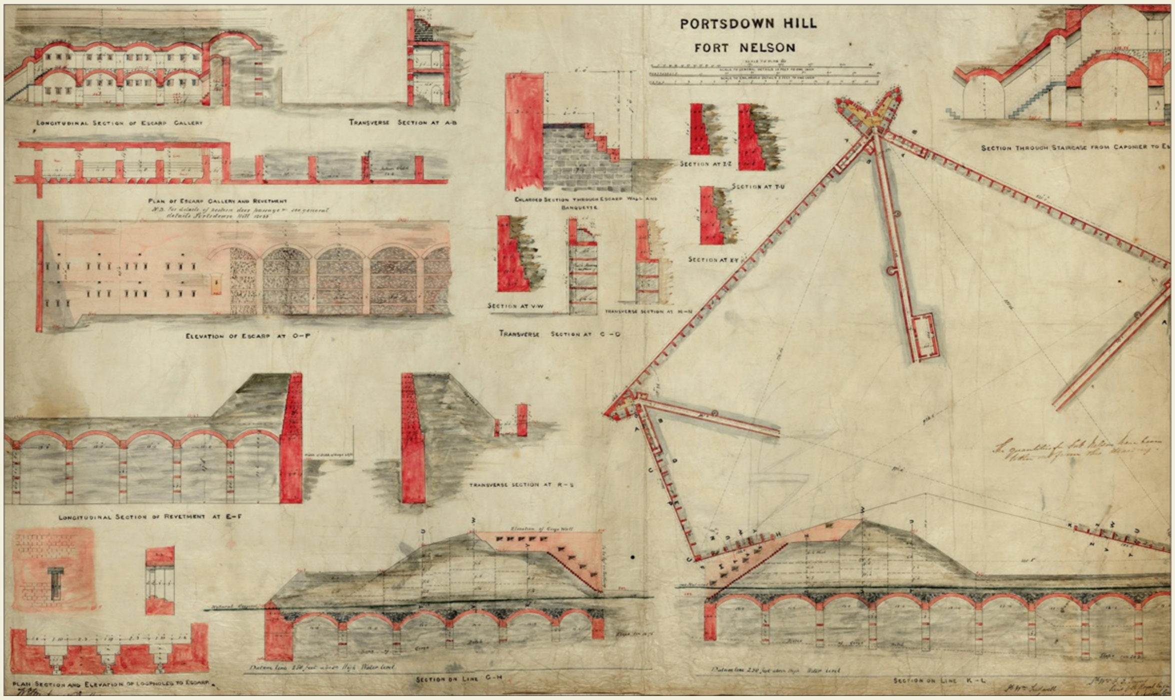
T'AI-P'ING-LI MILITARY POST, CHINA UNDATED.

‘PALMERSTON FOLLIES’, ENGLAND

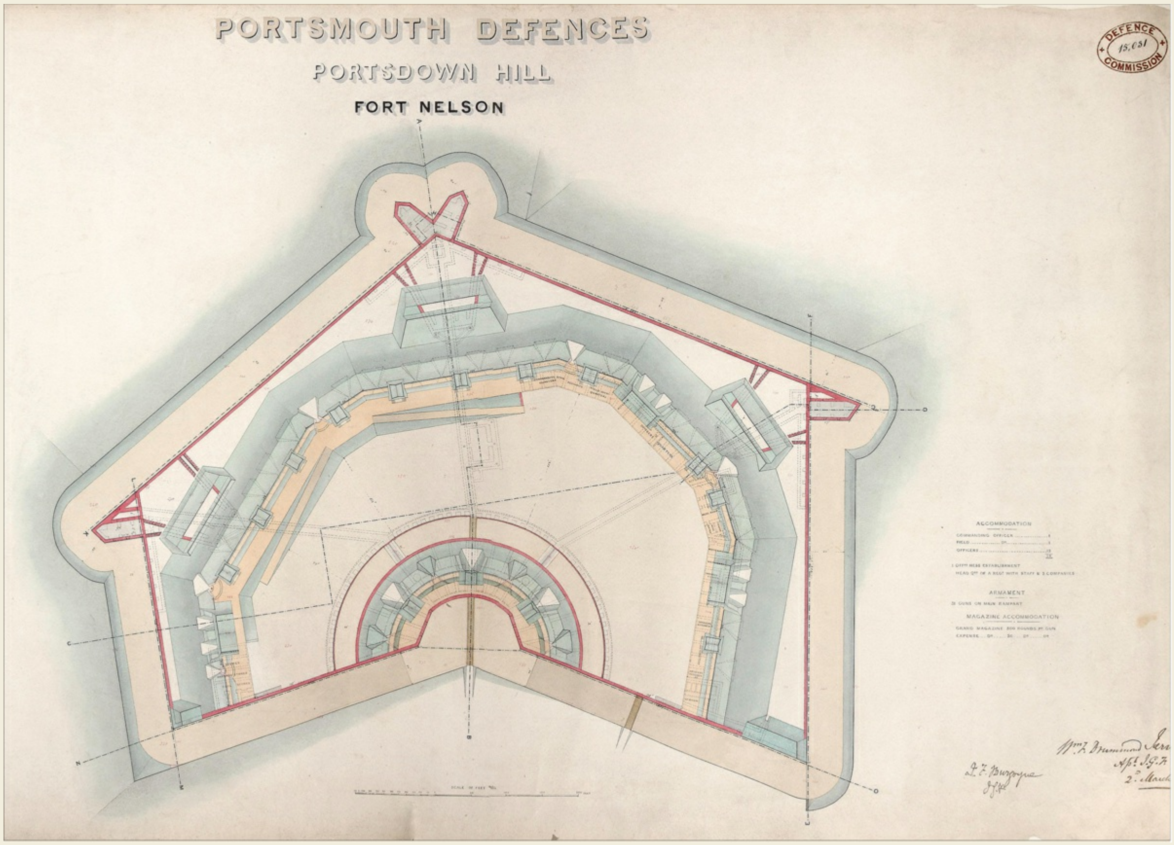
In 1844, François, Prince of Joinville, a key French admiral, published *Note sur l’état naval des forces navales de la France*, in which he presented steamships as a means by which France could challenge Britain. Worried about the growing strength of the French navy, seen with their ordering of six ironclads in 1858, the British both pressed forward their own naval procurement, laying down HMS *Warrior*, the first large sea-going iron-hulled warship, in 1860 and spent heavily on fortifications to protect their naval bases. Viscount Palmerston referred in Parliament to a ‘steam bridge’ across the Channel able to serve the cause of French invasion. In 1869, British warships off Dover demonstrated how they would provide covering fire for an invasion force, an exercise displayed in the *Illustrated London News* of 10 April.


CONTRACT DRAWING Nº 11
PORTSMOUTH DEFENCES
PORTSDOWN HILL
FORT NELSON
DETAILS OF MORTAR BATTERY ON EAST FLANK
Section on Line S-T
Section on Line L-M
Upper Plan of Mortar Battery
Plan of Mortar Battery
Section on Line N-O
Section on Line E-F
Section on Line G-H
Section on Line I-K
Section on Line A-B
Section on Line C-D
Section on Line U-V
Section on Line P-R

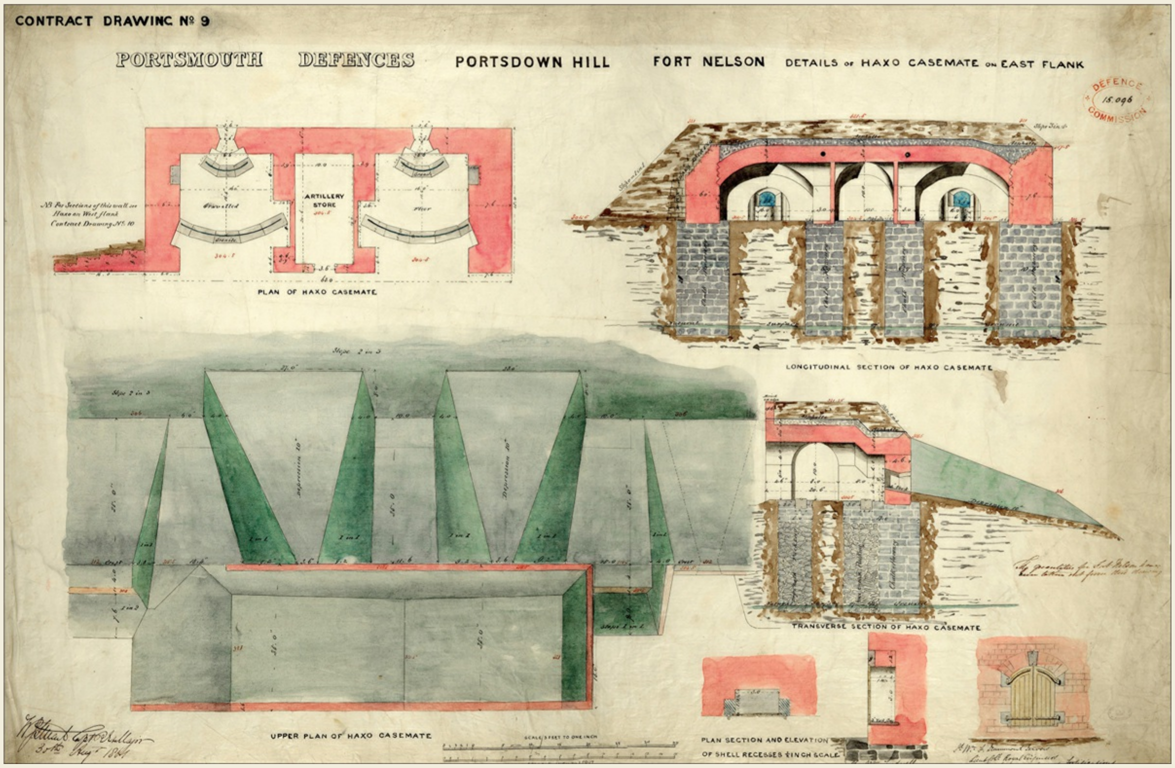
PLAN OF FORT NELSON AT PORTSDOWN HILL OVERLOOKING THE SOLENT. SHOWN HERE ARE DETAILS OF THE ESCARP (DITCH) AND REVETMENT (RETAINING WALL).


PORTSDOWN HILL
FORT NELSON
Longitudinal Section of Escarp Gallery
Transverse Section at A-B
Plan of Escarp Gallery and Revetment
Enlarged Section through Escarp Wall and Banquette
Section at S-T
Section at T-U
Section at X-Y
Section at V-W
Transverse Section at M-N
Transverse Section at C-D
Elevation of Escarp at O-P
Longitudinal Section of Revetment at E-F
Transverse Section at R-S
Section through Staircase from Caponier to E
Plan Section and Elevation of Loopholes to Escarp
Section on Line G-H
Section on Line K-L

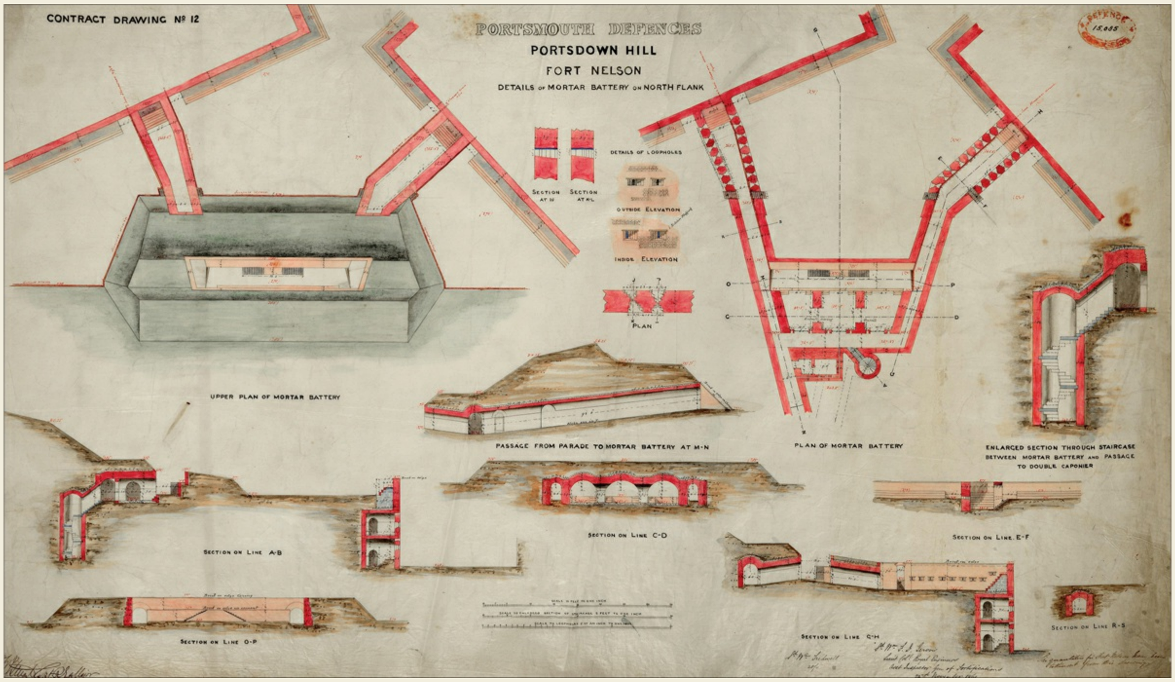
PLANS OF THE MORTAR BATTERY ON THE EAST FLANK AT FORT NELSON.


PORTSMOUTH DEFENCES
PORTSDOWN HILL
FORT NELSON
DEFENCE
15,031
COMMISSION
ACCOMMODATION
ARMAMENT
MAGAZINE ACCOMMODATION
J. F. Burgoyne

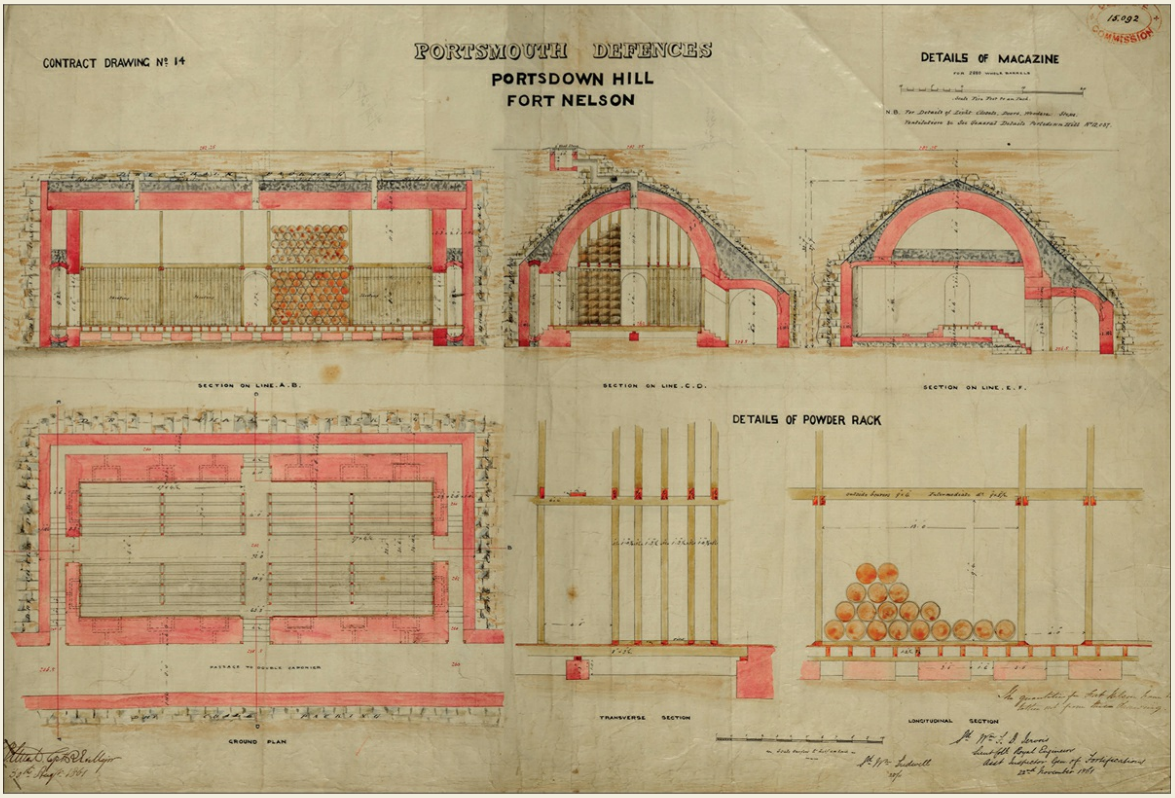
PLAN OF FORT NELSON SHOWING ACCOMMODATION FOR THE COMMANDING OFFICER AND OTHER OFFICERS, THE MESS ESTABLISHMENT AND THE POSITION OF 31 GUNS ON THE MAIN RAMPART.


CONTRACT DRAWING Nº 9
PORTSMOUTH DEFENCES
PORTSDOWN HILL
FORT NELSON
DETAILS of HAXO CASEMATE on EAST FLANK
DEFENCE COMMISSION
15.096
N.B. For Sections of this wall see Haxo on West flank Contract Drawing No. 10
Gravelled
Granite
ARTILLERY STORE
Floor
PLAN OF HAXO CASEMATE
LONGITUDINAL SECTION OF HAXO CASEMATE
Slope 2 in 3
TRANSVERSE SECTION OF HAXO CASEMATE
UPPER PLAN OF HAXO CASEMATE
PLAN SECTION AND ELEVATION OF SHELL RECESSES 1/2 INCH SCALE

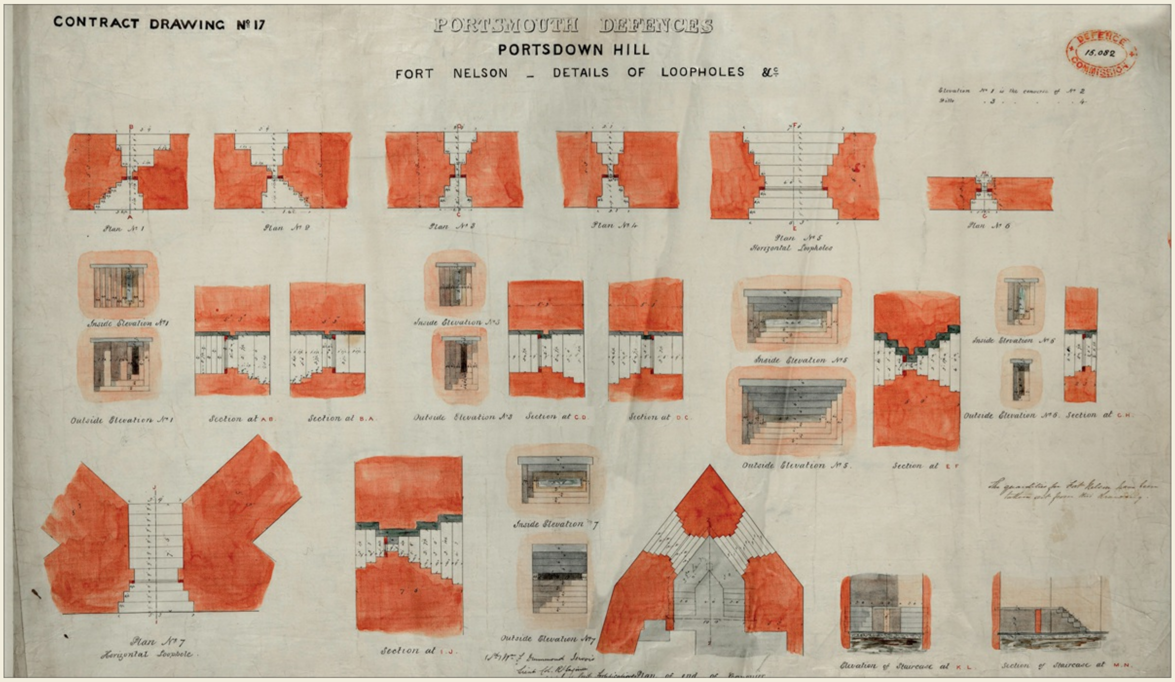
DETAILS OF THE HAXO CASEMATE (A FORTIFIED GUN EMPLACEMENT) ON FORT NELSON'S EAST FLANK.


CONTRACT DRAWING No 12
PORTSMOUTH DEFENCES
PORTSDOWN HILL
FORT NELSON
DETAILS OF MORTAR BATTERY ON NORTH FLANK
15,055
DETAILS OF LOOPHOLES
SECTION AT U
SECTION AT K-L
OUTSIDE ELEVATION
INSIDE ELEVATION
PLAN
UPPER PLAN OF MORTAR BATTERY
PASSAGE FROM PARADE TO MORTAR BATTERY AT M-N
PLAN OF MORTAR BATTERY
ENLARGED SECTION THROUGH STAIRCASE BETWEEN MORTAR BATTERY AND PASSAGE TO DOUBLE CAPONIER
SECTION ON LINE A-B
SECTION ON LINE C-D
SECTION ON LINE E-F
SECTION ON LINE G-H
SECTION ON LINE R-S
SECTION ON LINE O-P

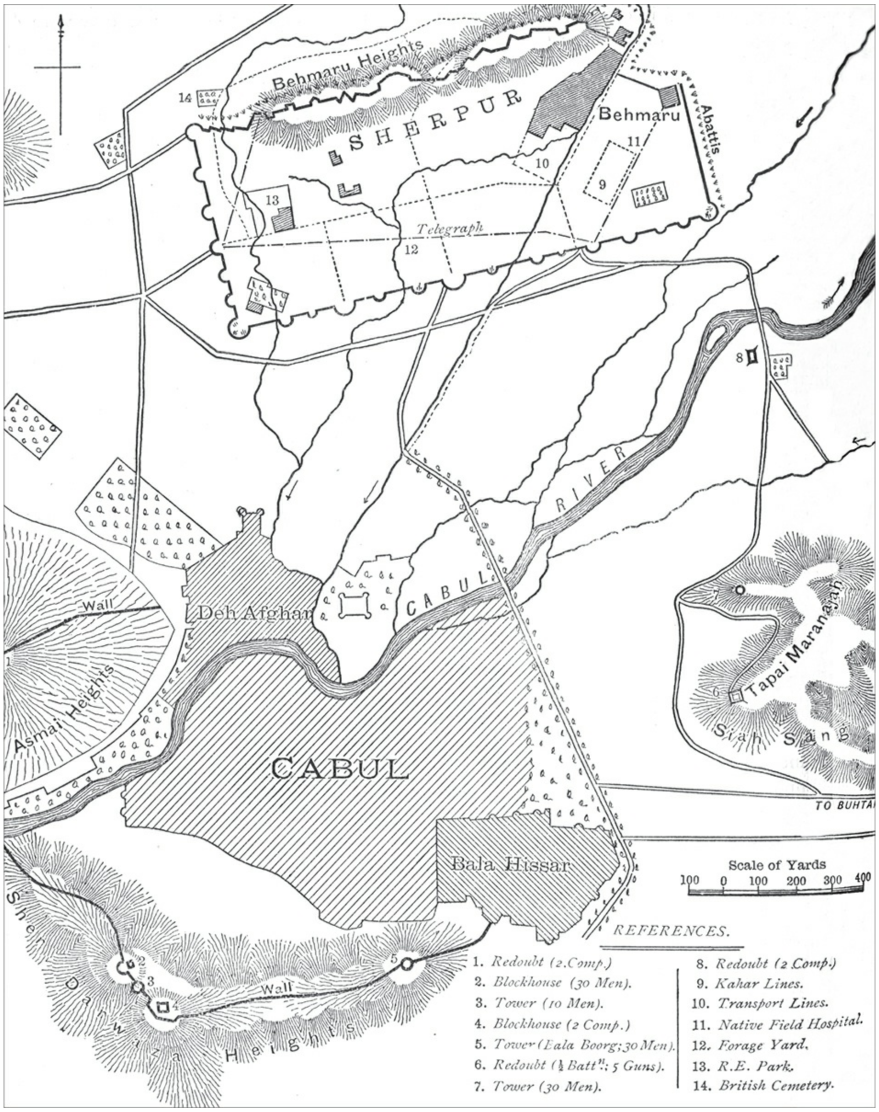
PLANS OF THE MORTAR BATTERY ON THE NORTH FLANK AT FORT NELSON.


CONTRACT DRAWING No 14
PORTSMOUTH DEFENCES
PORTSDOWN HILL
FORT NELSON
DETAILS OF MAGAZINE
FOR 2880 WHOLE BARRELS
15,092
COMMISSION
SECTION ON LINE A.B.
SECTION ON LINE C.D.
SECTION ON LINE E.F.
DETAILS OF POWDER RACK
PASSAGE TO DOUBLE CAPONIER
GROUND PLAN
TRANSVERSE SECTION
LONGITUDINAL SECTION

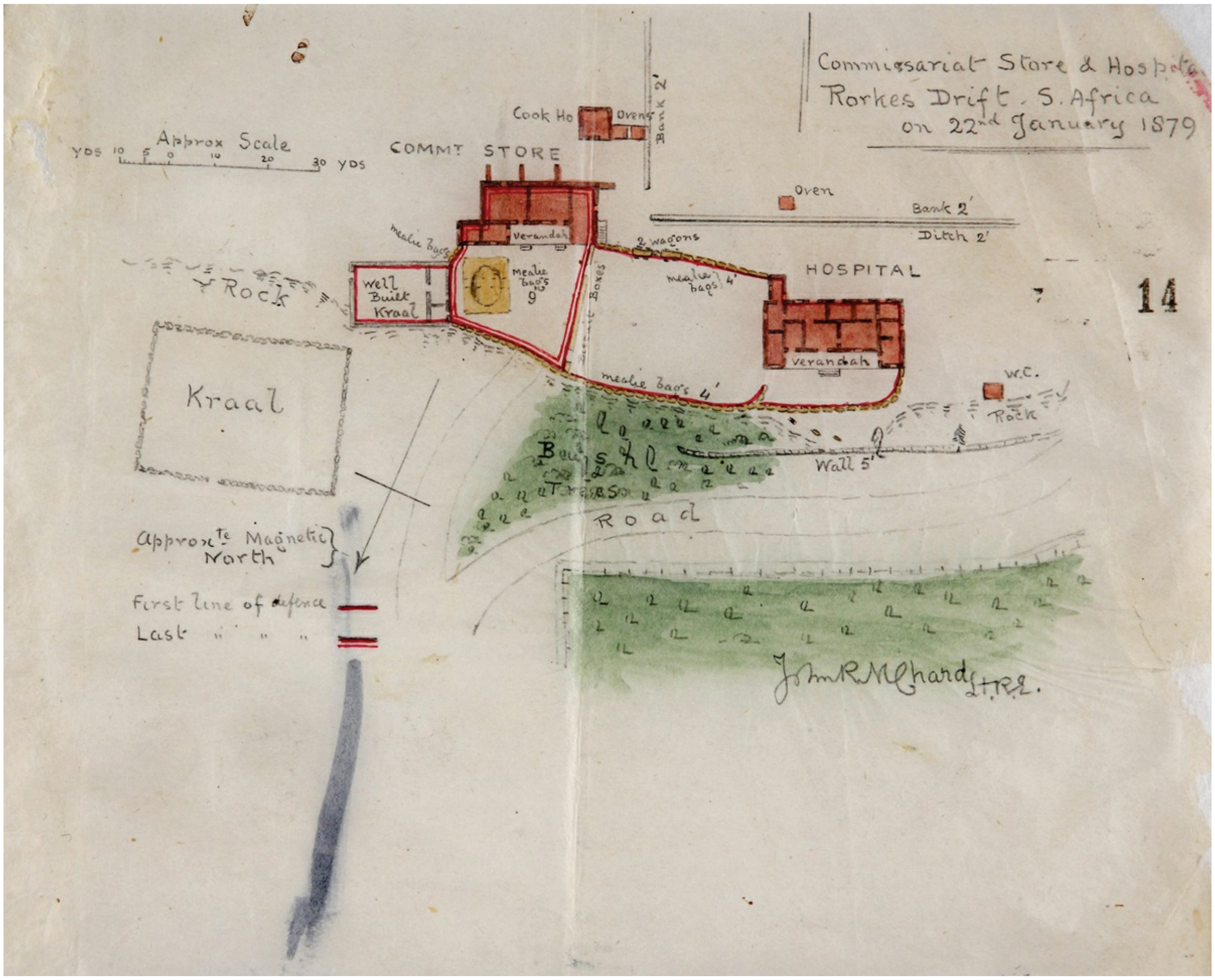
DETAILS OF THE MAGAZINE (FOR 2880 WHOLE BARRELS) AND POWDER RACK AT FORT NELSON.


CONTRACT DRAWING No 17
PORTSMOUTH DEFENCES
PORTSDOWN HILL
FORT NELSON _ DETAILS OF LOOPHOLES &c
DEFENCE COMMISSION 15,082
Elevation No 1 is the converse of No 2
Ditto 3 4
Plan No 1
Plan No 2
Plan No 3
Plan No 4
Plan No 5
Horizontal Loopholes
Plan No 6
Inside Elevation No 1
Outside Elevation No 1
Section at A.B.
Section at B.A.
Inside Elevation No 3
Outside Elevation No 3
Section at C.D.
Section at D.C.
Inside Elevation No 5
Outside Elevation No 5
Section at E.F.
Inside Elevation No 6
Outside Elevation No 6.
Section at G.H.
Plan No 7
Horizontal Loophole.
Section at I.J.
Inside Elevation No 7
Outside Elevation No 7
The quantities for Fort Nelson have been taken out from this drawing.
(Sd) Wm. J. Drummond Jervois
Plan of end of Banquette
Elevation of Staircase at K.L.
Section of Staircase at M.N.

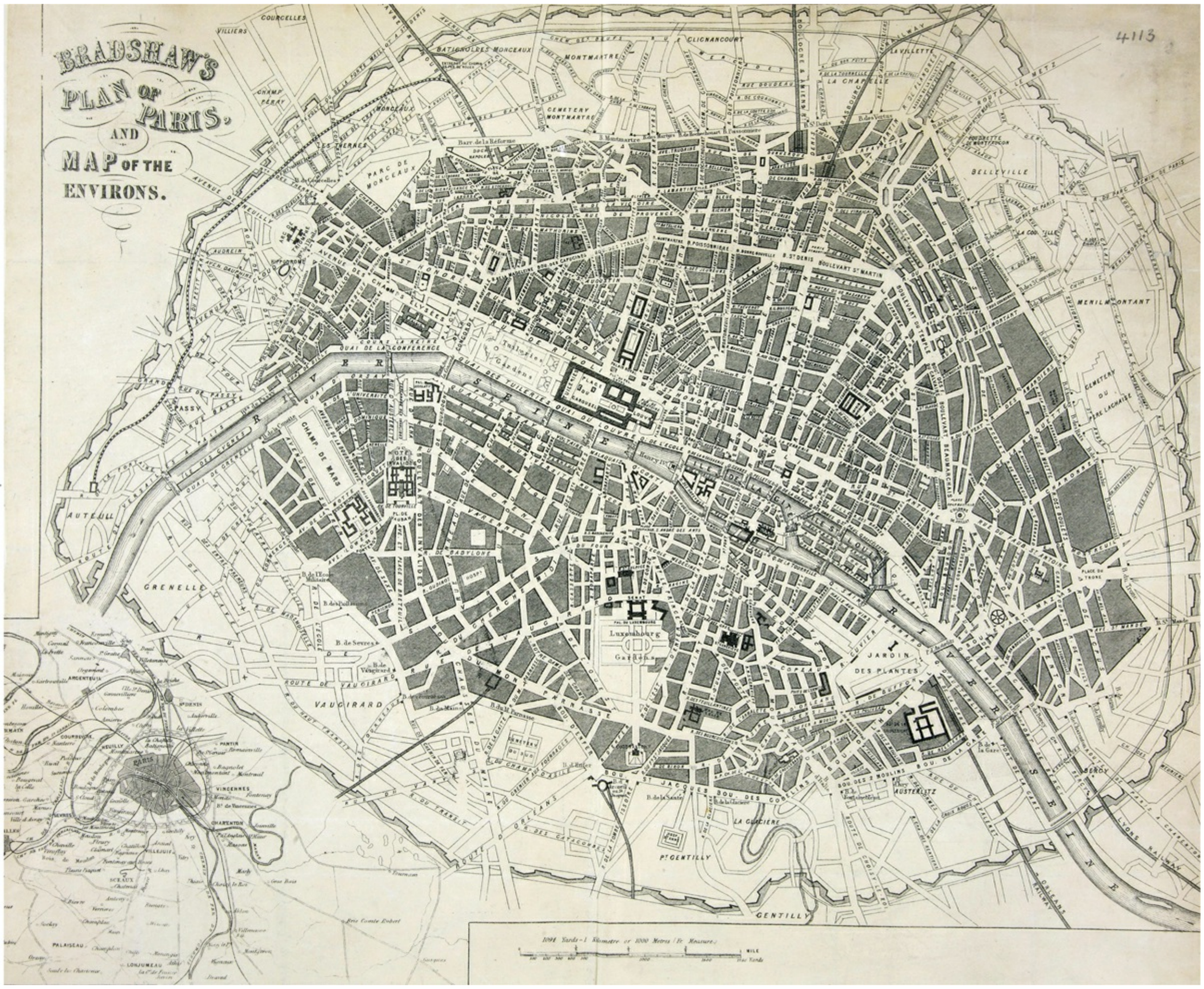
DETAILS OF THE LOOPHOLES AT FORT NELSON.


Behmaru Heights
SHERPUR
Behmaru
Abattis
Telegraph
14
13
12
11
10
9
8
RIVER
CABUL
Deh Afghan
Wall
Asmai Heights
CABUL
Bala Hissar
Tapai Maranajan
Siah Sang
TO BUHTAK
Sher Darwaza Heights
Scale of Yards
100 0 100 200 300 400
REFERENCES.
1. Redoubt (2.Comp.)
2. Blockhouse (30 Men).
3. Tower (10 Men).
4. Blockhouse (2 Comp.)
5. Tower (Bala Boorg; 30 Men).
6. Redoubt (½ Battn.; 5 Guns).
7. Tower (30 Men).
8. Redoubt (2 Comp.)
9. Kahar Lines.
10. Transport Lines.
11. Native Field Hospital.
12. Forage Yard.
13. R.E. Park.
14. British Cemetery.

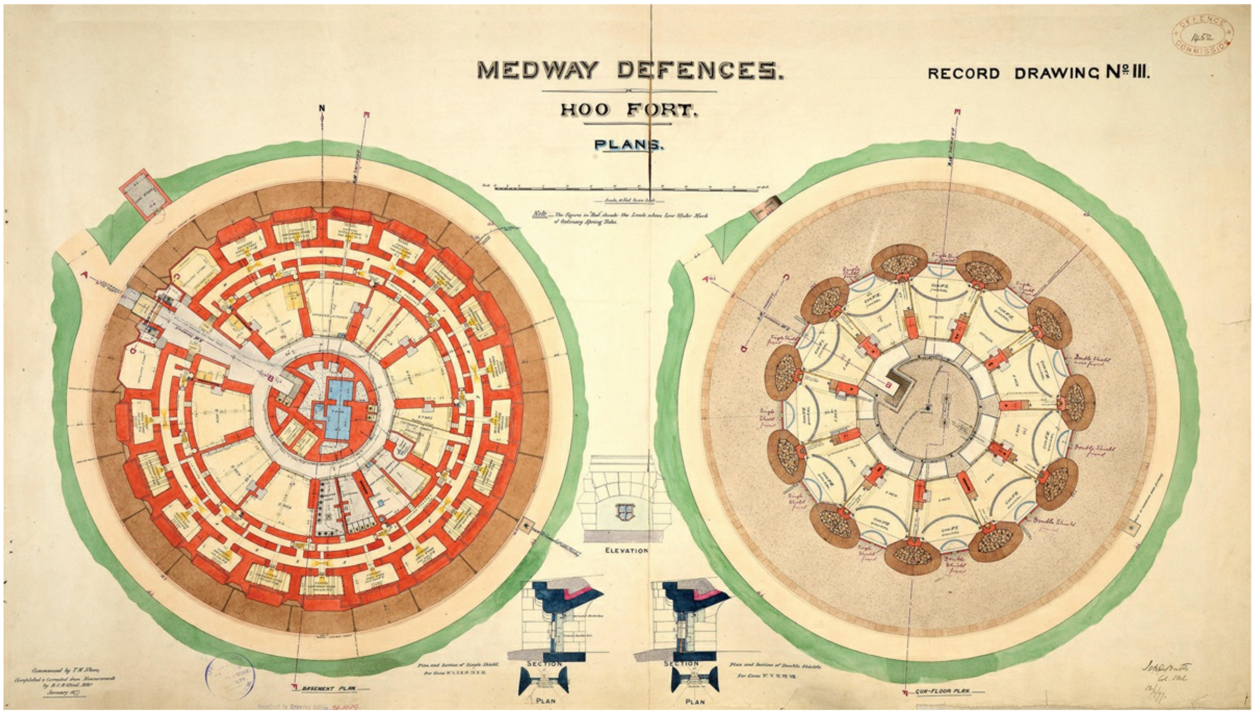
SHERPUR CANTONMENT, AFGHANISTAN, 1879 Audiences at home were rapidly brought news of war abroad, and this news was increasingly illustrated in the late nineteenth century. In late 1879, during the Second Anglo-Afghan War, the British force under Major-General Sir Frederick Roberts near Kabul entrenched itself in the Sherpur Cantonment. It was besieged by the Afghans under Mohammad Jan Khan Wardek from 15 December, but the news of a relief column led to an unsuccessful attempt to storm it on 23 December. The Afghans were repulsed with heavy casualties.


Commissariat Store & Hosp
Rorkes Drift. S. Africa
on 22nd January 1879
Approx Scale
YDS 10 5 0 10 20 30 YDS
COMMT STORE
Cook Ho
Ovens
Bank 2'
Oven
Bank 2'
Ditch 2'
14
Verandah
mealie Bags
2 wagons
HOSPITAL
Well Built Kraal
Mealie bags 9
Boxes
mealie bags 4'
Rock
Kraal
mealie Bags 4'
Verandah
W.C.
Rock
Bush & Trees
Wall 5'
Road
Approxte Magnetic North
First line of defence
Last " " "
John R M Chard Lt R.E.

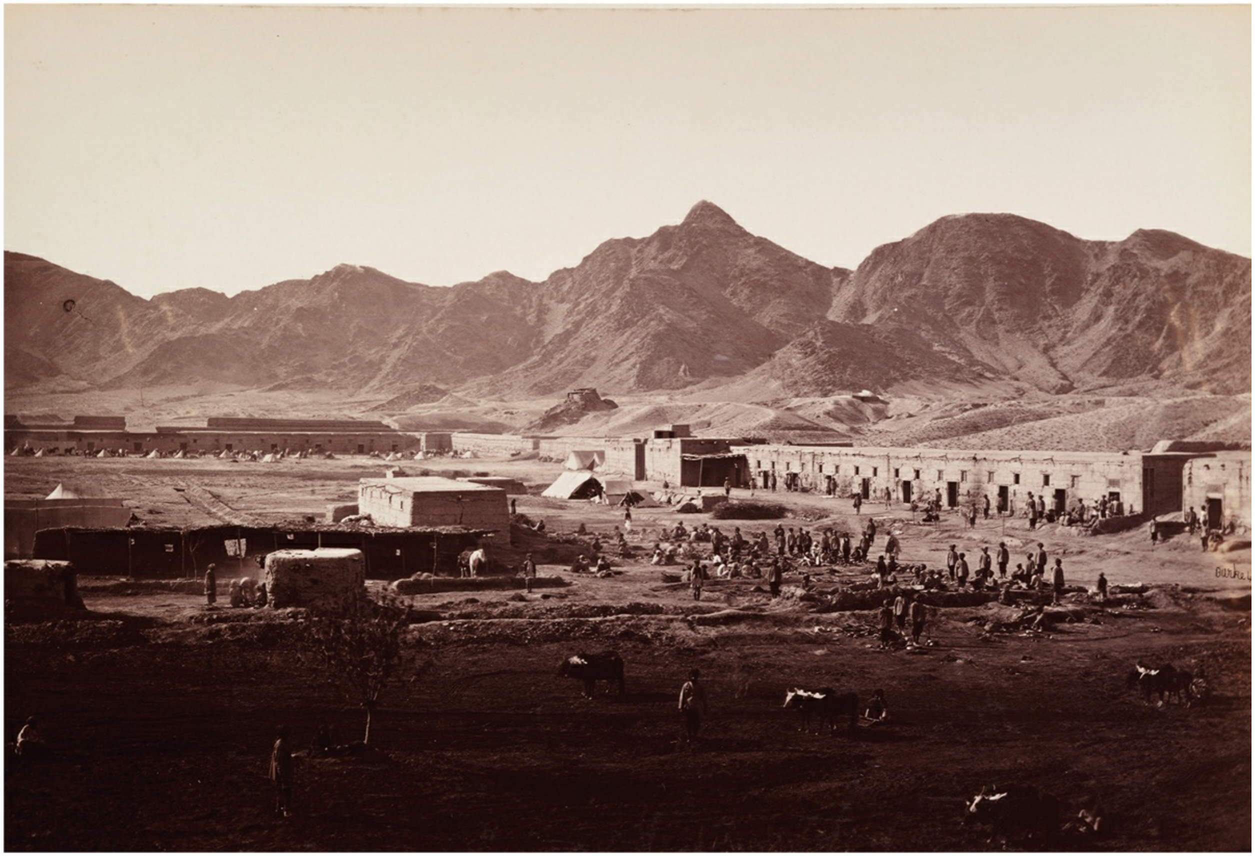
LIEUTENANT JOHN CHARD'S DESPATCH FROM RORKE'S DRIFT, 1879, AND BACK OF RORKE'S HOUSE, SOUTHERN AFRICA Rorke's Drift was a battle in the Anglo-Zulu War fought on 22–23 January 1879 after the destruction of a British force nearby at Isandlwana. John Chard, the commander of the garrison of 139 soldiers, received the Victoria Cross for the defeat of 3,000–4,000 Zulus. Rorke's Drift was an isolated mission station near a crossing point over the Buffalo River. It contained two thatched bungalows, which were used as a storehouse and a hospital. A defensive perimeter was constructed of mealie bags, with biscuit boxes providing a last line of defence, behind which the British eventually retreated. The British lost 17, the Zulus at least 351.


BRADSHAW'S PLAN OF PARIS, AND MAP OF THE ENVIRONS.
4113
RIVER SEINE
CHAMP DE MARS
JARDIN DES PLANTES
Luxembourg Gardens
BELLEVILLE
MONTMARTRE
LA CHAPELLE
LA VILLETTE
AUTEUIL
PASSY
GRENELLE
VAUGIRARD
GENTILLY
CLIGNANCOURT
BATIGNOLLES MONCEAUX
PARC DE MONCEAUX
CEMETERY MONTMARTRE
CEMETERY DU PERE LACHAISE
MENILMONTANT
LA GLACIERE
AUSTERLITZ
PLACE DU TRONE
PARIS

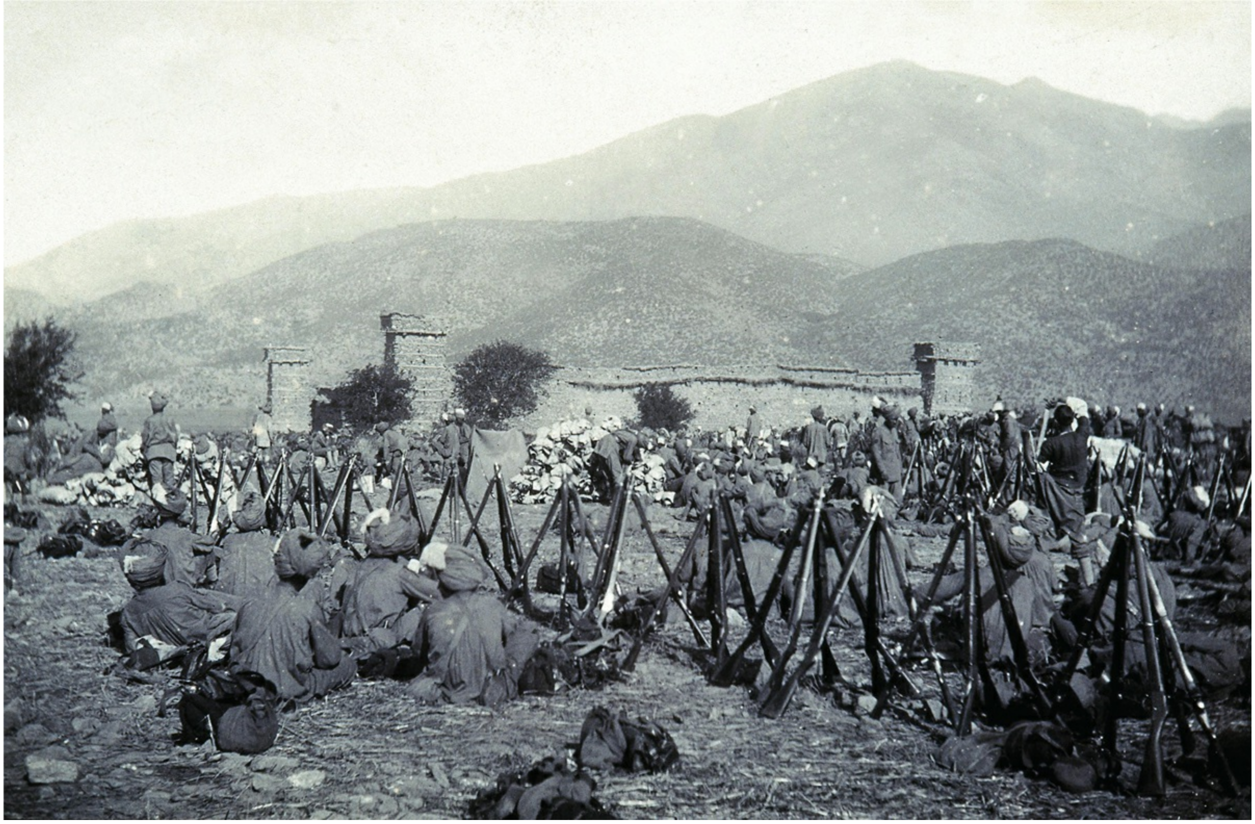
PARIS, FRANCE, FORTIFICATIONS *c.*1860 From the 1830s, the French had developed defence in depth for Paris. In September 1870, during the Franco-Prussian War, the Germans besieged Paris. There was no attempt to storm the city but instead a reliance on starvation. The length of the siege posed major supply problems for both sides and led the Germans to bombard Paris from 5 January 1871. The failure of relief attempts, Paris running out of food, casualties and damage caused by the shelling and war weariness led to an armistice signed on 28 January. The radical Paris Commune then took control, only to be crushed by Republican forces that May. The barricades erected by the Communards were overcome. France devoted much attention to fortification against Germany after 1871 and in 1914 Paris acted as an effective entrenched camp for the French army preparatory to the successful French counter-attack at the battle of the Marne. The city wall of Paris built between 1841 and 1844 was only destroyed in 1919–29.


MEDWAY DEFENCES.
HOO FORT.
PLANS.
RECORD DRAWING Nº III.
N
ELEVATION
SECTION
SECTION
PLAN
PLAN
BASEMENT PLAN
GUN-FLOOR PLAN
DEFENCE COMMISSION
1452

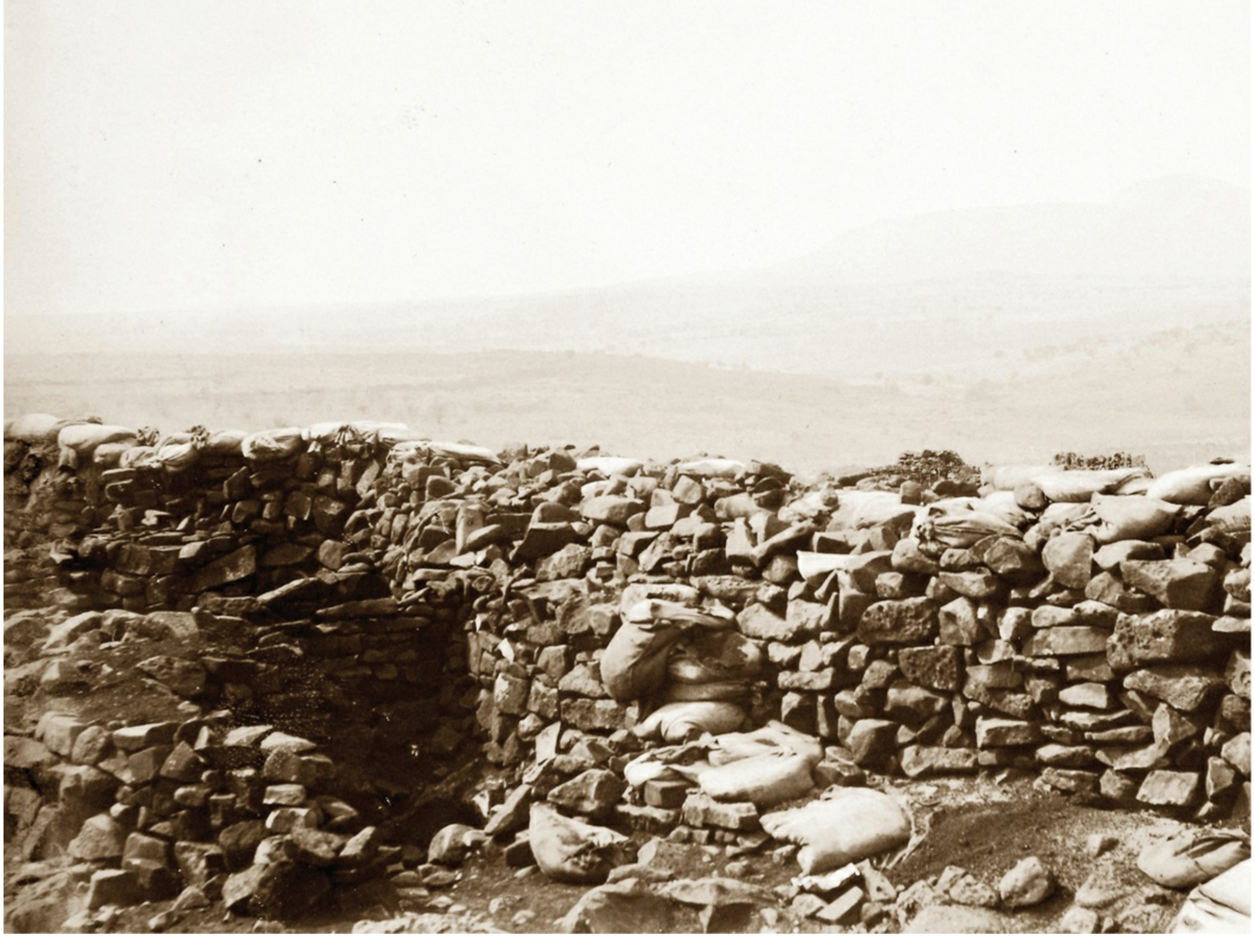
HOO FORT, ENGLAND, 1877 A product of the defence panic caused by the French development of steam-powered ironclad warships, Fort Hoo was built on the recommendations of the 1859 Royal Commission to protect the River Medway and the Chatham dockyard. As with many fortifications, for example those protecting the approaches to Melbourne, Fort Hoo was designed as part of a defensive system, in this case protecting a boom across the Medway with Fort Darnet on another island in the river. Originally, the forts were intended to have two tiers of guns mounted in a circle. They were begun accordingly in 1861, but problems with subsidence and cost overruns led to the forts being redesigned in 1867 and completed in 1871 with only a single tier of eleven 9-inch rifled muzzle-loading guns, and with no boom. A dry ditch was part of the defence. The forts were never used in action. Defences around the Solent and on the Channel Islands were also improved.



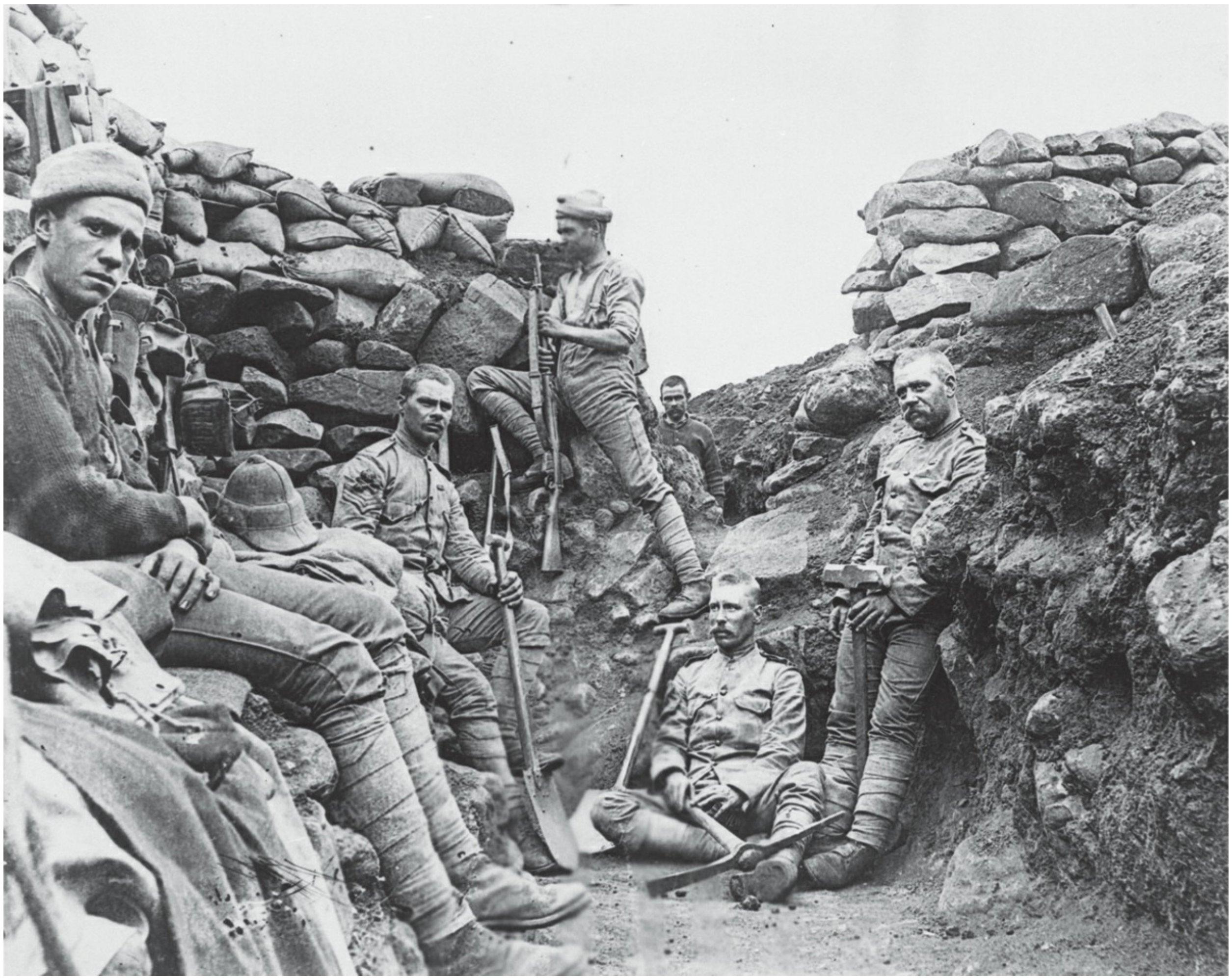
DAKKA FORT, AFGHANISTAN, 1879 In November 1878, in the first stage of the Second Anglo-Afghan War, the British Peshawar Valley Field Force fought its way into Afghanistan, capturing the forts of Ali Masjid and Dakka on the Afghan side of the Khyber Pass. Dakka became a key position on the British supply lines. This photograph was taken by John Burke, who accompanied the army. It shows the tents and horses of an Indian regiment in the fort, with the Hindu Kush beyond and ploughing in the foreground. The fort had stone walls and a stable in the centre. Barracks were built within the fort. On 22 April 1879, a large Afghan force attacked British units based at the nearby village of Kam Dakka. Under heavy attack they were finally relieved from Dakka.



FORTRESS, CHITRAL CAMPAIGN, PAKISTAN, 1895 Traditional forms of fortification continued to be important in many parts of the world. The Chitral expedition was sent by the British to relieve the fort at Chitral, which was under siege during local rivalries in which the British protégé was murdered. A 343-strong British force was besieged in the fort, a mud, stone and timber work, until it was relieved by a larger force after a serious clash in the high Malakand Pass. Short of food, the garrison was described as ‘walking skeletons’.



BRITISH DEFENCE WORKS, LADYSMITH, SOUTH AFRICA Besieged by the Boers from 2 November 1899 to 28 February 1900, Ladysmith was a garrison town in northern Natal. A sortie to capture the Boer artillery failed and the Boers then surrounded the town. The first British relief attempt was defeated at the battle of Colenso on 15 December 1899. To support their defence, the British had constructed a line of forts and entrenchments on the reverse side of the Platrand, a ridge south of Ladysmith. On 6 January 1900, a Boer attempt to storm the positions failed. The defenders lacked water and food and suffered disease, but a British relief force broke through the Boer positions on 27 February and rode into Ladysmith next evening. As so often, relief operations were crucial to the success of a siege.



BRITISH TROOPS DIGGING DEFENCES IN THE BOER WAR A reminder of the need for spades and pickaxes, and of the way in which what was dug out could be piled up.

THE TWENTIETH CENTURY

In many respects, World War I (1914–18) was about fortifications far more than other major conflicts over the previous century, for the trench systems that were constructed at the end of 1914 marked an effective form of fortification, one designed to repel frontal attack but also outflanking.

Initially, however, the war appeared to demonstrate the lack of viability of fortresses. The Belgian fortress complexes all fell in 1914 after bombardment by 305mm and 420mm heavy howitzers produced before the war specifically for this purpose. The latter fired 2,052lb high-explosive shells able to penetrate ten feet of concrete.

Nevertheless, Liège took far longer to fall than the Germans anticipated – 11 days instead of two – and this operation delayed the provision of an adequate supply system to support the German advance across Belgium. The initial attacks on Liège were driven back on 5 August 1914, but the fortification system depended on a powerful force to fill the gaps between the 12 armoured forts. In its absence, the Germans were able to move through these gaps, although the forts continued to resist, some until 16 August. The Germans thus gained mobility. Namur and Antwerp also fell, the first after only four days' bombardment, and the Germans were able to advance without worrying about fortresses.

TRENCH WARFARE

However, checked in the field in 1914, notably in the battle of the Marne, and later in the First Battle of Ypres, the German war of manoeuvre failed. It was replaced by the creation of trench systems in order to protect troops from machine guns, to lessen their vulnerability to artillery and to hold on to territory. Indeed, World War I fitted into a continuum in which, as small arms and artillery became more powerful during the nineteenth century, the role of trenches for protection increased. Moreover, trenches had already figured in the siege of fortresses in order to protect the attackers, as at Sevastopol in 1854–55, and the role of the use of trenches in assaulting an entrenched enemy was highlighted in the Russo-Japanese War of 1904–05 when the Japanese employed trenches in such operations, notably in the assault on Port Arthur in 1904–05, an assault that took the Japanese five months due to the strength of the Russian defensive firepower. The Japanese 11-inch siege howitzers were unable to suppress the defences.

Trench warfare became even more important in World War I. The strength of trench positions owed much to the weaponry available for their protection and which they could protect, especially quick-firing artillery and machine guns with their impressive range and rapidity of fire. Barbed wire and concrete fortifications enhanced the defensive positions that were rapidly constructed, while reserves provided defence in depth. Aside from trenches, there were also particular fortresses, such as Austrian-held Przemyśl in southern Poland, Metz in Lorraine, then part of the German Empire, and Verdun in France.

Przemyśl was protected by 127,000 troops, but besieged by six Russian divisions. In September 1914, in the absence of siege artillery, the Russians launched an unsuccessful and costly assault. In November 1914, a second siege began, in which bombardment was compounded by starvation, while relief attempts and sallies failed. The city surrendered in March 1915, a heavy blow to Austrian morale.

Verdun had great symbolic significance for the French, notably for politicians who resolutely linked national glory to their presentation of the self-sacrificing dedication of the troops. It was also seen as important to the defence of Paris against attack from the north-east. Heavily attacked in 1916, Verdun was protected by a series of detached forts, notably Douaumont and Vaux, and their concrete casements and steel cupolas were resistant to bombardment, although field defences played the key role in the protection.

In 1917, the Germans pulled back from their front line, the location of which reflected the results of the fighting that had hitherto taken place, notably the 1916 British Somme offensive, to a new shorter line designed to offer a more effective defence. This Siegfried Line, known to the Allies as the Hindenburg Line, replaced deep dugouts and continuous trench lines packed with infantry, by mutually supporting concrete bunkers, surrounded by obstacle belts. This system provided a more potent and relevant fortification system that included a flexible defence in depth, a defence that challenged traditional notions of siegecraft. Reverse slope positions were used to reduce vulnerability to artillery, while with its three defence lines, the ‘Line’ was up to 15 miles deep.

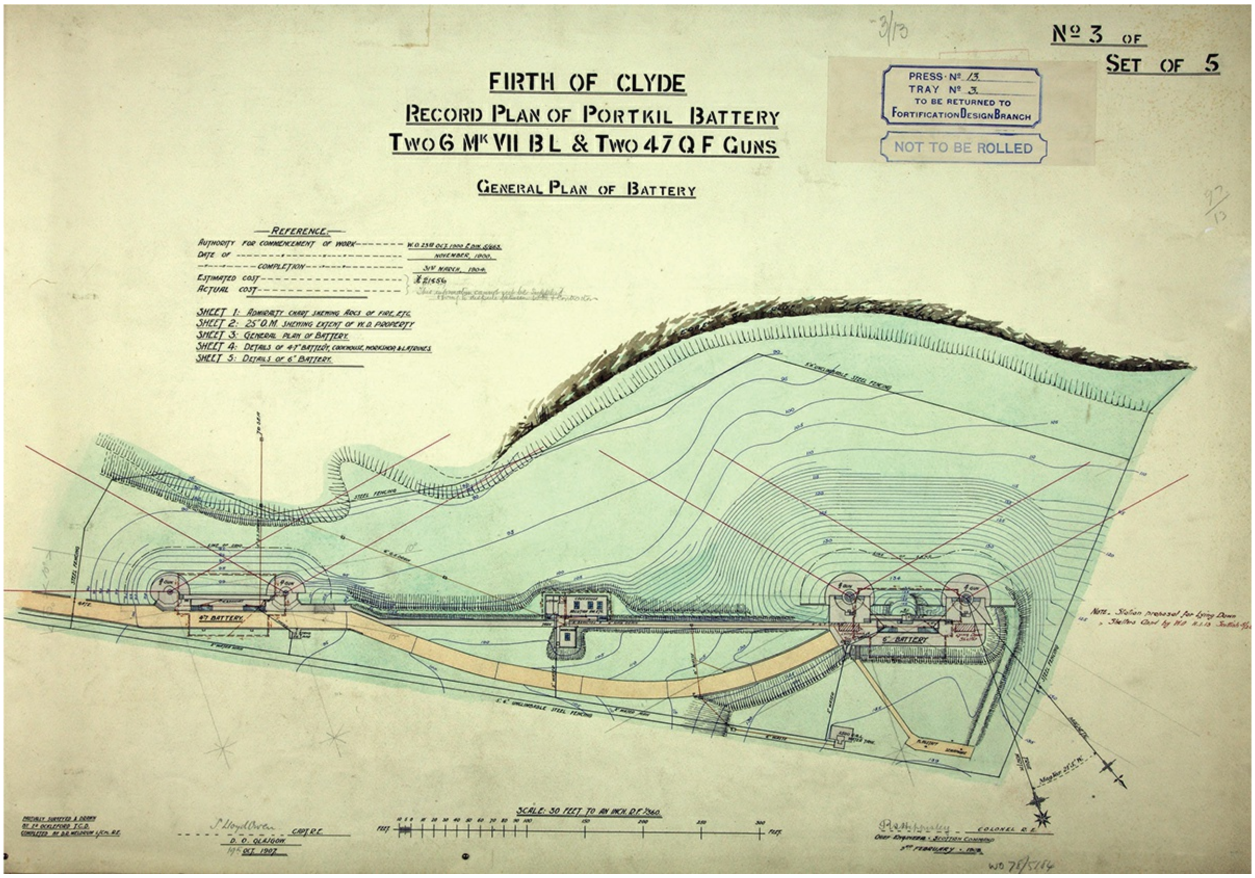
PORT ARTHUR, MANCHURIA The Japanese employed trenches in the eventually successful assault on Port Arthur during the 1904–05 Russian-Japanese War. The siege took five months due to the strength of Russian defensive firepower. The Russian positions rested on a line of hills which proved the focus of successive assaults covered by bombardments. Japanese frontal attacks suffered heavy casualties. The Russian defence was mishandled, with a lack of coordination between units. Eleven-inch siege howitzers helped the Japanese who ably coordinated their artillery fire.

The successful Allied assault on the Hindenburg Line near Cambrai on 27 September 1918 led the German generals to move rapidly towards an armistice. This assault reflected the development of appropriate artillery and infantry tactics, including deep battle in which targets beyond the front, such as headquarters, were being bombarded. Trench warfare evolved into deep battle, with help from aerial reconnaissance. The Allies had also developed the mechanisms, notably greatly improved logistics, and deployed the resources, particularly large numbers of guns, necessary to sustain their advance and offensive in the face of continual resistance and across a broad front. Thomas Blamey, an Australian officer, noted that the campaign differed from earlier operations in that there was an emplacement of a large proportion of artillery within 2,000 yards of the front line, which enabled the advance to be covered by an effective barrage to a depth of 4,000 yards into enemy country.

SYSTEMS OF FORTIFICATIONS

Before World War II, there was much investment in systems of fortifications, notably with the French Maginot Line, but also the Finnish Mannerheim Line, the Dutch Water Line, the German Westwall and the American fortifications to protect Manila Bay, notably on the island of Corregidor, the 'Gibraltar of the Pacific'. At Sevastopol, the Soviet navy installed battleship guns, able to fire at land and sea targets, in reinforced concrete fortifications with armoured turrets. Their record, and those of fortifications constructed during the war, were mixed. None of the fortification systems mentioned above prevented failure.

The lack of an appropriate, or at least successful, plan was seen with the French Maginot Line, named after André Maginot, the Minister of War in 1922–24 and again in 1928–30. Begun in 1930 to offset Germany's larger population, this was an economy of force measure and a means to create jobs. The fortifications were regarded as an aspect of a force structure that could support an offensive or a defensive strategy. The fortresses were intended to constrain attacking options, as they indeed did. Sir Archibald Montgomery-Massingberd, the perceptive Chief of the [British] Imperial General Staff, saw the Maginot Line as providing support for operational mobility:



-3/13

Nº 3 of
Set of 5

PRESS Nº 13
TRAY Nº 3
TO BE RETURNED TO
FORTIFICATION DESIGN BRANCH

NOT TO BE ROLLED

97/13

FIRTH OF CLYDE

RECORD PLAN OF PORTKIL BATTERY

TWO 6 Mk VII B L & TWO 4.7 Q F GUNS

GENERAL PLAN OF BATTERY

— REFERENCE. —

Authority for commencement of work — W.O. 23rd Oct. 1900 & Min. 5/663.
Date of — November, 1900.
— completion — 31st March, 1904.
Estimated cost — £21556
Actual cost — This information cannot yet be supplied owing to dispute between WD & Contractor

SHEET 1: Admiralty chart shewing arcs of fire, etc.
SHEET 2: 25" O.M. shewing extent of W.D. property
SHEET 3: General plan of Battery.
SHEET 4: Details of 4.7" Battery, cookhouse, workshop & latrines
SHEET 5: Details of 6" Battery.

Note. Station proposed for Lying Down
" Shelters Conc by W.O. 8.1.13 Scottish

SCALE: 30 FEET TO AN INCH. R.F. 1/360.

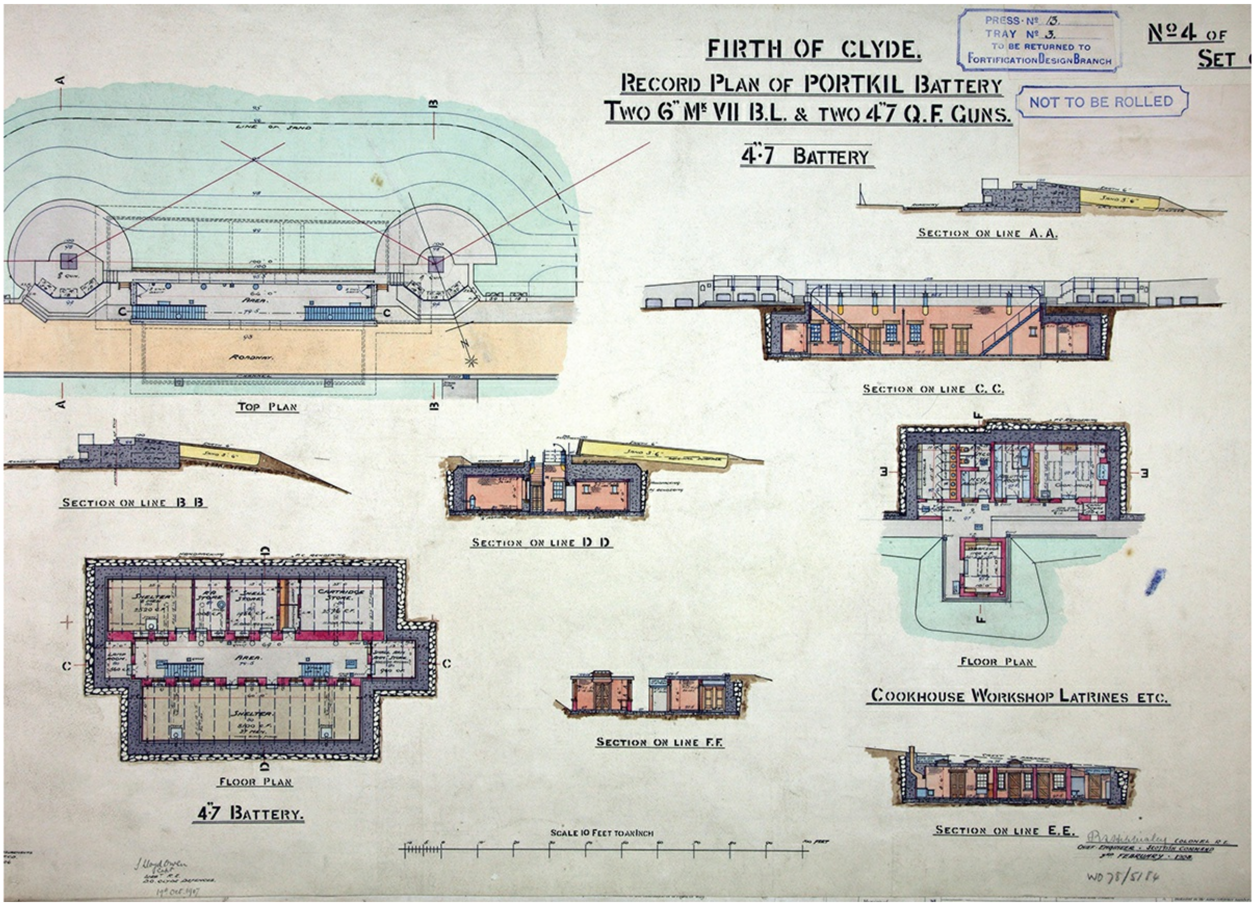
FEET 10 5 0 10 20 30 40 50 60 70 80 90 100 150 200 250 300 FEET

Partially surveyed & drawn
by Sr Ockleford T.C.D.
Completed by D.D. Weldoun L/Cpl. R.E.

S Lloyd Owen Capt. R.E.
D. O. Glasgow
19th Oct. 1907

R Hippisley Colonel R.E.
Chief Engineer · Scottish Command
3rd February · 1913.

WO 78/5164


FIRTH OF CLYDE.
RECORD PLAN OF PORTKIL BATTERY
TWO 6" Mk VII B.L. & TWO 4.7 Q.F. GUNS.
4·7 BATTERY
PRESS Nº 13.
TRAY Nº 3.
TO BE RETURNED TO
FORTIFICATION DESIGN BRANCH
NOT TO BE ROLLED
Nº 4 OF
SET
SECTION ON LINE A.A.
AREA
ROADWAY
TOP PLAN
SECTION ON LINE C.C.
SECTION ON LINE B B
SECTION ON LINE D D
FLOOR PLAN
COOKHOUSE WORKSHOP LATRINES ETC.
SHELTER
CARTRIDGE STORE
AREA
SHELTER
FLOOR PLAN
4·7 BATTERY.
SECTION ON LINE F.F.
SECTION ON LINE E.E.
SCALE 10 FEET TO AN INCH
COLONEL R.E.
CHIEF ENGINEER · SCOTTISH COMMAND
3rd FEBRUARY · 1908
WO 78/5154

PORTKIL BATTERY ON THE FIRTH OF CLYDE, SCOTLAND A coastal battery at Portkil on the Rosneath peninsula that had been planned from the mid-Victorian period to cover the River Clyde, a key centre of British shipbuilding and trade. In 1899, it was decided that the battery would be for two 6-inch and two 4.7-inch quick-firing guns. The position included searchlight batteries as well as pillboxes, blockhouses and trenches to protect the battery from land attack. The fort was decommissioned in 1928–29.

ADRIANOPLE (EDIRNE), TURKEY In the Balkan Wars of 1912–13, the power of entrenched positions supported by artillery when neither had been suppressed by superior offensive artillery was fully shown. The surrounded Turkish fortress of Adrianople (Edirne) held out for several months against Bulgarian attacks before surrendering in 1913.

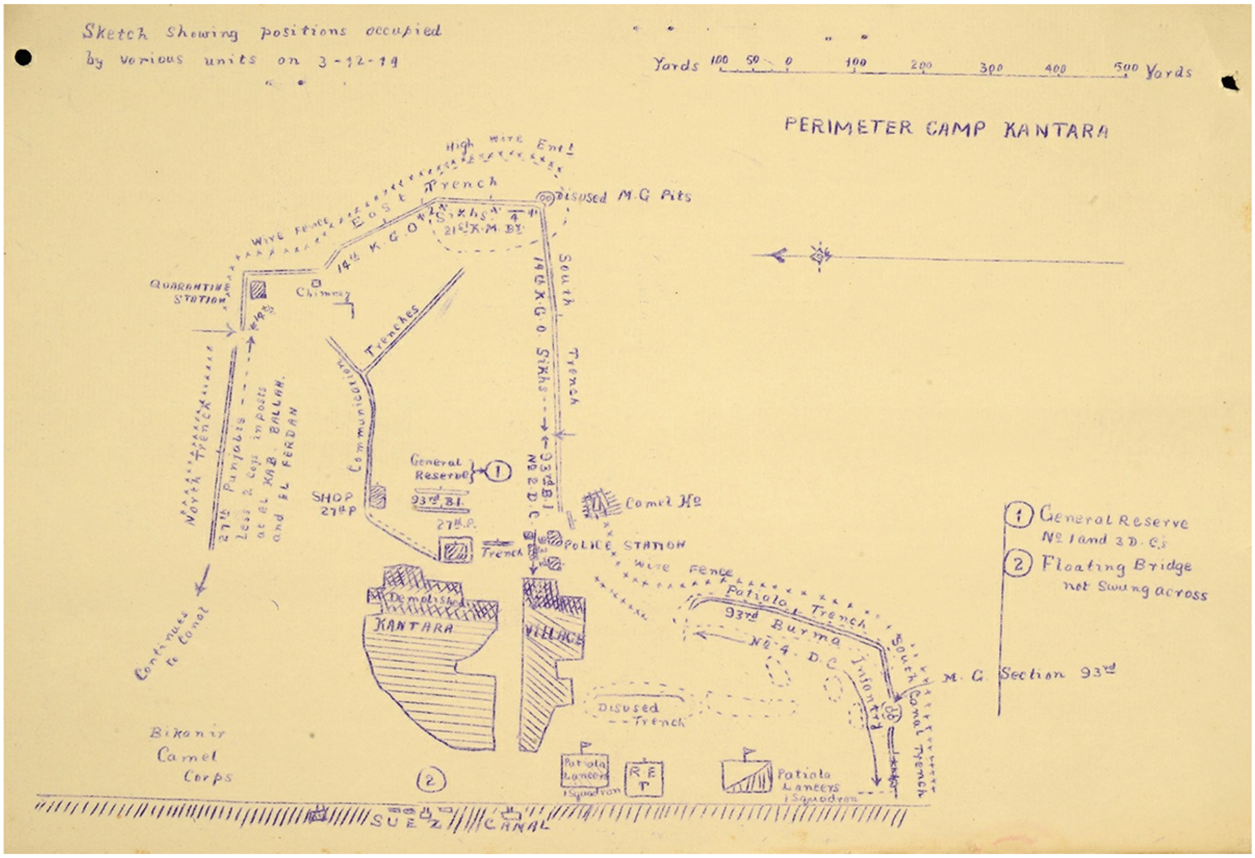
'My recollections of our attacks against strong lines during the war, even with masses of heavy guns and tanks, is that this frontier, in three or four years will be practically impregnable, always provided of course that the French keep up their present garrison and maintain everything at the standard they are doing at present. Here again the

underlying idea is of economy in men so as to set free as many troops as possible for the mobile army.'

He also commented on the strength of the French fortifications facing Italy – 'tunnelled as they are under 40 or 50 feet of rock, with embrasures for guns and machine guns covering every approach'.

In the event, in 1940, the French proved unable to devise and implement an adequate plan for effective mobile warfare. The Maginot Line guided the direction of the German attack to the north of the Line through Belgium, but the Germans brilliantly gained and retained the initiative in the area in which they advanced.

Fortifications could also be blasted through by artillery, as the Soviets did with the Mannerheim Line in 1940. This triumph brought their Winter War with Finland to the successful conclusion that is generally neglected due to the usual focus on earlier Finnish successes. Japanese air and artillery bombardment weakened the defences of Corregidor in 1942, preparing the way for a successful amphibious assault and the rapid fall of the island.


Sketch showing positions occupied
by various units on 3-12-14
Yards 100 50 0 100 200 300 400 500 Yards
PERIMETER CAMP KANTARA
High Wire Ent
East Trench
Disused M.G Pits
Wire Fence
14th K.G.O
2nd Sikhs
21st K.M. By
Quarantine Station
Chimney
Trenches
South Trench
14th K.G.O Sikhs
North Trench
27th Punjabis Less 2 Coys in posts at EL KAB. BALLAH. and EL FERDAN
Communication
General Reserve ①
93rd B.I.
No 2 D.C
SHOP 27th P
27th P.
Trench
Camel Ho
POLICE STATION
Wire Fence
Patiala Trench
93rd Burma
No 4. D.C
Infantry
South Canal Trench
M.G Section 93rd
① General Reserve No 1 and 3 D.Cs
② Floating Bridge not Swung across
Demolished
KANTARA
VILLAGE
Disused Trench
Continues to Canal
Bikanir Camel Corps
②
Patiala Lancers 1 Squadron
R.E T
Patiala Lancers 1 Squadron
SUEZ CANAL

POSITIONS NEAR KANTARA, EGYPT, 1914 The outbreak of World War I led to a new set of defensive requirements for each of the combatants. For Britain, this included defence of the Suez Canal, the major axis of its empire, against a Turkish overland attack, which, indeed, was unsuccessfully mounted in 1915. The defence involved the deployment of warships, aircraft and troops. Kantara, near the northern end of the canal, was a defence headquarters that became, from 1916, the main supply depot of the advance into Sinai. Infantry garrisoned the perimeter trench, which was protected by a wire fence. There were additional trenches to protect the position in which the reserve was based.

The Atlantic Wall built by the Germans to defend the French coast against Allied invasion showed in 1944 that ferroconcrete was very resistant to high explosive, but the defences were damaged or rapidly outflanked on 6 June. The Atlantic Wall neither prevented the landings nor seriously impeded them, the very difficult American experience on Omaha Bay notwithstanding. Even there, the troops still managed to get ashore and press inland in a matter of hours.

COMBINED ARMS STRATEGY IN WORLD WAR II

These varied campaigns indicated that, as with other weapon systems, fortifications proved most effective as part of a combined arms force, while the combined dimension was also dependent on an appropriate plan. Fortifications required a flexible, supporting, counter-attack defence, because bunkers and other individual fortified positions were vulnerable and, once engaged, the occupants (as was commonly the case with fortifications) were trapped inside unless a counter-attack hit the attackers when they were held up by the bunkers. All bunkers and casemates required apertures for guns, access for their crews and ventilation. With the right tactics and weapons (demolition charges, flamethrowers, grenades and tanks), most fortifications could be taken by attacking the occupants through these apertures, although it was time-consuming and tiring. In 1944, the Germans lacked sufficient mobile forces forward enough in Normandy to act in co-operation with the fixed coastal defences attacked by the Allies on D-Day. The subsequent use of other such defences to delay the Allies' capture of ports, notably Cherbourg, where the Germans destroyed much of the harbour, was countered by the Allies' ability to supply their forces across the beaches.

Similarly, as a need to put the role of fortifications in context, the American attack on the German Westwall, protecting Germany's frontier, failed in late 1944. In part, this was because of the fortifications, but also because the terrain and weather helped the defenders. Moreover, the recent rapid tempo of the American advance across France and Belgium had not prepared them for such fighting, not least due to major strains on American logistics.

During World War II, individual fortresses were important to the course of the conflict, notably Tobruk in North Africa, the capture of which delayed the German advance on the Nile. Sevastopol in Crimea, which the Germans captured in 1942 and the Soviets in 1944, was also significant. The first campaign proved a major distraction to German operations in 1941–42, with positional warfare using up troops. This happened again later in 1942 when the Germans surrendered mobility and attacked Stalingrad, a city that became an improvised fortress as Leningrad already had.

In turn, repeatedly when the Soviets attacked during the war, the Germans, under the influence of Hitler's focus on willpower, designated positions as fortresses that were to be held to the last man, for example Vitebsk, Orsha, Mogilev and Bobruisk in Belarus in 1944, and Breslau in Silesia in 1945, only for these to be isolated and to have scant influence on the campaigning. This had happened to the German forces in early 1943 in the part of Stalingrad they had captured. The Germans adopted a similar designation of fortresses elsewhere, for example Breskens in the Scheldt estuary in September 1944.

THE ROLE OF FORTS AFTER WORLD WAR II

Forts continued to be significant after World War II, although their role tends to be seriously downplayed. Indeed, this omission constitutes a flaw in some works on the history of fortifications. Major fortifications were dismantled, for example in 1948 the 16-inch gun emplacements at Fort Tilden (1924) and Navesink Highlands (1943) that had served to protect New York Harbour and the comparable positions protecting the naval base of Norfolk, Virginia. Anti-ship artillery appeared redundant in an age of air power. More generally, mobility and firepower might, separately and in combination, seem to have put paid to the need for fortifications.

However, the contrary has been the case. Fortifications might provide a clear target for attack, but they were intended to offer a base to protect firepower as well as to counter the impact of mobility. The Ichhogil Canal Line on the India-Pakistan border in Punjab was intended to thwart. India's plan was to use conventional superiority to launch a massive tank attack along the Lahore-Kasur sector. Pakistan, in the early 1960s, constructed an in-depth bank-cum-ditch defence along the canal. The western bank of the canal was made higher by 8–10 feet and machine guns, pill boxes, artillery and anti-tank guns were deployed on the bank. The canal was 10–15 feet deep. Pakistan's plan was that if the Indians attacked then their forces would reach the eastern bank only to receive fire from the higher western bank. In addition, the Indian army lacked the tools required to cross the deep canal. Pakistan's defensive strategy succeeded in stopping the massive tank attack launched by India in this sector during the Indo-Pakistani War of 1965. However, the Bar-Lev Line built by Israel on the eastern side of the Suez Canal fell rapidly to Egyptian attack in 1973.

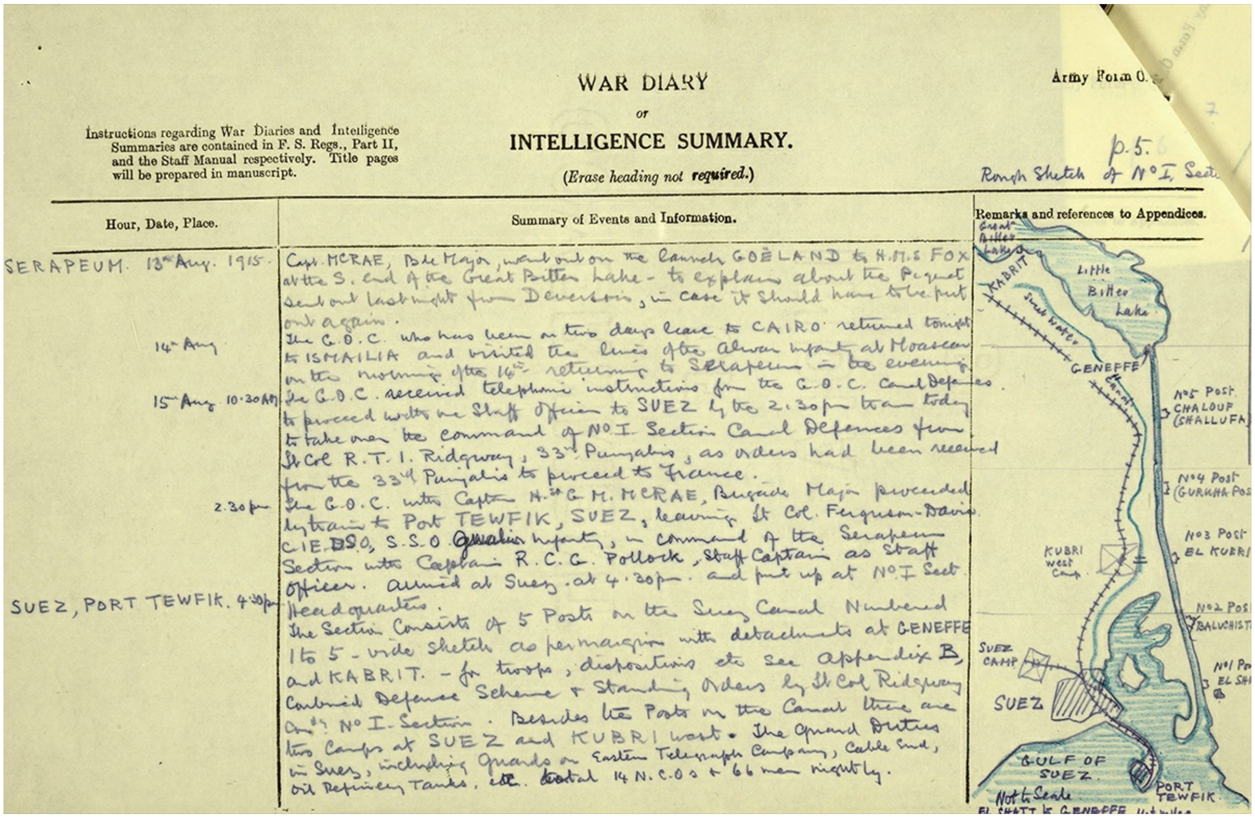
Moreover, the growing tendency from 1945 for insurrectionary warfare to become relatively more significant has meant that fortifications have become important for regular forces, both to protect them from irregulars, whether or not operating using conventional tactics, and from terrorist attacks. This was seen in a range of conflicts, notably in protecting colonial possessions, as with the French in Vietnam. The Viet Minh were defeated in 1951–52 when they switched to mass attacks on French *hérissons*, fortified hedgehog positions, in the open areas of the Red River delta, for example at Vinh Yen and Mao Khe. In contrast, French strongpoints at Dien Bien Phu were outgunned in 1954 by Viet Minh artillery and then fell to mass infantry attacks.

In the later Vietnam War, 'firebases' from which operations could be mounted were established and fortified by the Americans. In turn, the Viet Cong and North Vietnamese besieged and assaulted American-held bases that appeared vulnerable, such as Plei Me in 1965 and Khe Sanh in 1968, although these assaults provided a focus for American air attacks.

CIVIL WARS AND INSURRECTIONS

At a different scale, civil wars created the need for fortified positions. In insurrections in 'metropoles' (home countries, not colonies), there was an overlap between the protection of troops and that of the police. This was seen, for example, in Northern Ireland where the Provisional IRA, a radical Catholic separatist movement, sought to overthrow the government from the late 1960s to 1998. Most fortified posts were joint police and army posts. In the Catholic areas of Belfast and in the border region of South Armagh, they were fortified against the prevalent threats. These were fourfold: sniper attacks on the posts; rocket-propelled grenade attacks on the lookout towers; primitive but effective mortar attacks; and car bombs.

In response, corrugated iron sheets topped with razor wire provided a wall around most posts, which prevented observation of those living and working in the bases as well as sniper attack. Wire mesh screens, attached to the watch towers and placed several feet in front of them, were an effective deterrent against rocket-propelled grenades, which would explode against the mesh before hitting the tower itself. Living quarters and control-and-operations rooms in the most vulnerable bases had double-skinned roofs to protect them against mortar attacks. Large concrete blocks were placed in chicanes at the entrances to bases to prevent car bombs.



Army Form C.

WAR DIARY

or

INTELLIGENCE SUMMARY.

(*Erase heading not* **required.**)

Instructions regarding War Diaries and Intelligence Summaries are contained in F. S. Regs., Part II, and the Staff Manual respectively. Title pages will be prepared in manuscript.

p. 5.

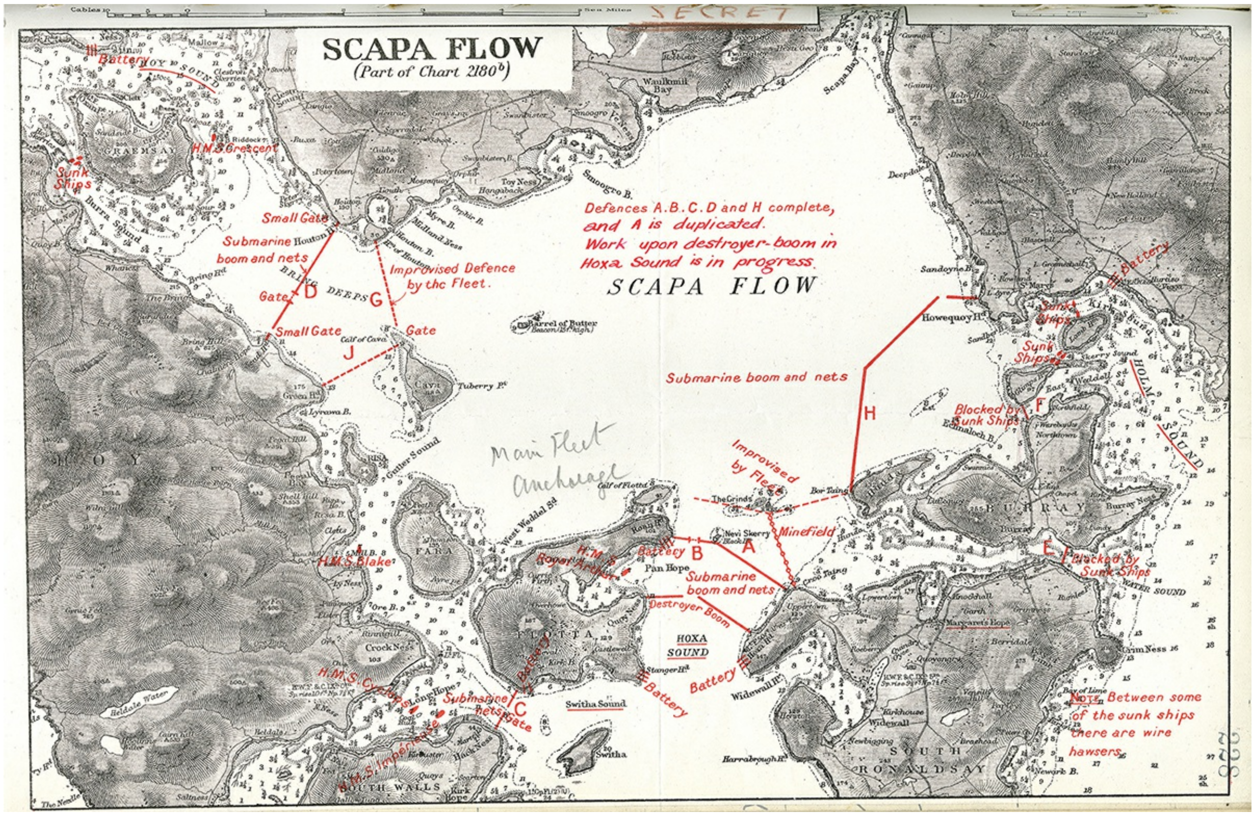
Rough Sketch of No I, Secti

Hour, Date, Place.	Summary of Events and Information.
SERAPEUM. 13th Aug. 1915.	Capt. MCRAE, Bde Major, went out on the launch GOËLAND to H.M.S FOX at the S. end of the Great Bitter Lake – to explain about the Picquet sent out last night from Deversoir, in case it should have to be put out again.
14th Aug	The G.O.C. who has been on two days leave to CAIRO returned tonight to ISMAILIA and visited the lines of the Alwar Infantry at Moascar on the morning of the 14th returning to SERAPEUM in the evening.
15th Aug 10.30AM	The G.O.C. received telephonic instructions from the G.O.C. Canal Defences to proceed with one Staff Officer to SUEZ by the 2.30pm train today to take over the command of No I. Section Canal Defences from Lt Col R.T.I. Ridgway, 33rd Punjabis, as orders had been received from the 33rd Punjabis to proceed to France.
2.30pm	The G.O.C. with Captain H. St G. M. MCRAE, Brigade Major proceeded by train to Port TEWFIK, SUEZ, leaving Lt Col. Ferguson-Davie C.I.E. D.S.O, S.S.O Gwalior Infantry, in command of the Serapeum Section with Captain R.C.G. Pollock, Staff Captain as Staff Officer. arrived at Suez at 4.30pm. and put up at No I Sect. Headquarters.
SUEZ, PORT TEWFIK. 4.30pm	The Section consists of 5 Posts on the Suez Canal Numbered 1 to 5 – vide sketch as per margin with detachments at GENEFFE and KABRIT. – for troops, dispositions etc see appendix B, Combined Defence Scheme & Standing Orders by Lt Col Ridgway Comd'g No I. Section. Besides the Posts on the Canal there are two Camps at SUEZ and KUBRI west. The Guard Duties in Suez, including Guards on Eastern Telegraph Company, Cable End, Oil Refinery Tanks, etc. total 14 N.C.Os + 66 men nightly.

Remarks and references to Appendices.

Great Bitter Lake
KABRIT
Sweet Water
Little Bitter Lake
GENEFFE
Canal
No5 Post. CHALOUF (SHALLUFA
No4 Post (GURKHA Pos
No3 Post EL KUBRI
KUBRI west Camp
No2 Pos BALUCHIST
SUEZ CAMP
No1 Po EL SH
SUEZ
GULF OF SUEZ
PORT TEWFIK
Not to Scale
EL SHATT to GENEFFE

SUEZ CANAL DEFENCES, EGYPT, WORLD WAR I This sketch shows the southern defences of the Suez Canal, with an accompanying war diary. There were posts on the eastern side of the canal and camps on the western side.


SECRET
SCAPA FLOW
(Part of Chart 2180b)
Battery
HOY SOUND
H.M.S. Crescent
Sunk Ships
GRAEMSAY
Burra Sound
Small Gate
Submarine boom and nets
Gate
D
BRING DEEPS
G
Improvised Defence by the Fleet.
Small Gate
Gate
J
CAVA
Defences A.B.C.D and H complete, and A is duplicated. Work upon destroyer-boom in Hoxa Sound is in progress.
SCAPA FLOW
Submarine boom and nets
H
Battery
Sunk Ships
Sunk Ships
Blocked by Sunk Ships
F
HOLM SOUND
Main Fleet Anchorage
Improvised by Fleet
Minefield
HOY
FARA
H.M.S. Blake
H.M.S. Royal Arthur
Battery
B
A
Submarine boom and nets
Destroyer Boom
HOXA SOUND
Battery
Battery
FLOTTA
BURRAY
E
Blocked by Sunk Ships
WATER SOUND
H.M.S. Cyclops
Submarine nets
C
Gate
H.M.S. Imperieuse
Battery
Switha Sound
SOUTH WALLS
SOUTH RONALDSAY
NOTE. Between some of the sunk ships there are wire hawsers.

SCAPA FLOW DEFENCES, SCOTLAND, 1915 It was felt necessary in the face of the German submarine threat to withdraw the British Grand Fleet from the North Sea and its base at the anchorage of Scapa Flow in the Orkney Islands in 1914 to new bases on the north-west coast of Scotland. It did not return until 1915 when the base's defences had been strengthened, including by submarine booms and nets, minefields and the blocking of channels by sinking ships between which there were wire hawsers.

These measures proved largely effective in protecting the occupants of the company-sized patrol bases. By the end of the 'Troubles', a number of police stations had been rebuilt to incorporate defensive measures. The new Woodbourne Police Station in West Belfast, for instance, had a 21-foot brick-built wall around the entire site. Most of the patrol bases were quickly dismantled after the Good Friday Agreement.

The standard pattern of protective features, one of blast-proof walls, narrow slit-type windows with toughened glass, barbed wire atop walls, outside obstacles in order to prevent any direct or close approach by vehicles, and protected compounds, became commonplace across the world, and for a range of buildings, from military bases and police stations to embassies, court buildings and banks.

In areas with a high rate of instability and lawlessness, such defences were important for all non-religious centres of authority, and even for many households, for example internal protective rooms or 'cages' in the event of housebreakers coming in, as in Johannesburg in South Africa. The situation clearly paralleled that of the medieval period with the need to fortify both public and private buildings, fortification being a key aspect of public and private insurance.

CHANGING EMPHASIS

This situation went through several overlapping stages from 1945 with differing emphases. The protection of colonial control was the key theme from the late 1940s to the early 1970s, but was then supplanted by a wave of violent opposition within states, notably in Central America. In turn, terrorism became a greater concern, while in the 2000s this concern combined with interventionist warfare by American-led coalitions that fortified bases against attack, especially air bases such as Bagram near Kabul. In addition, bases were rapidly constructed on Afghanistan's open plateau by using local soil and sand to fill pre-prepared containers piled atop each other.

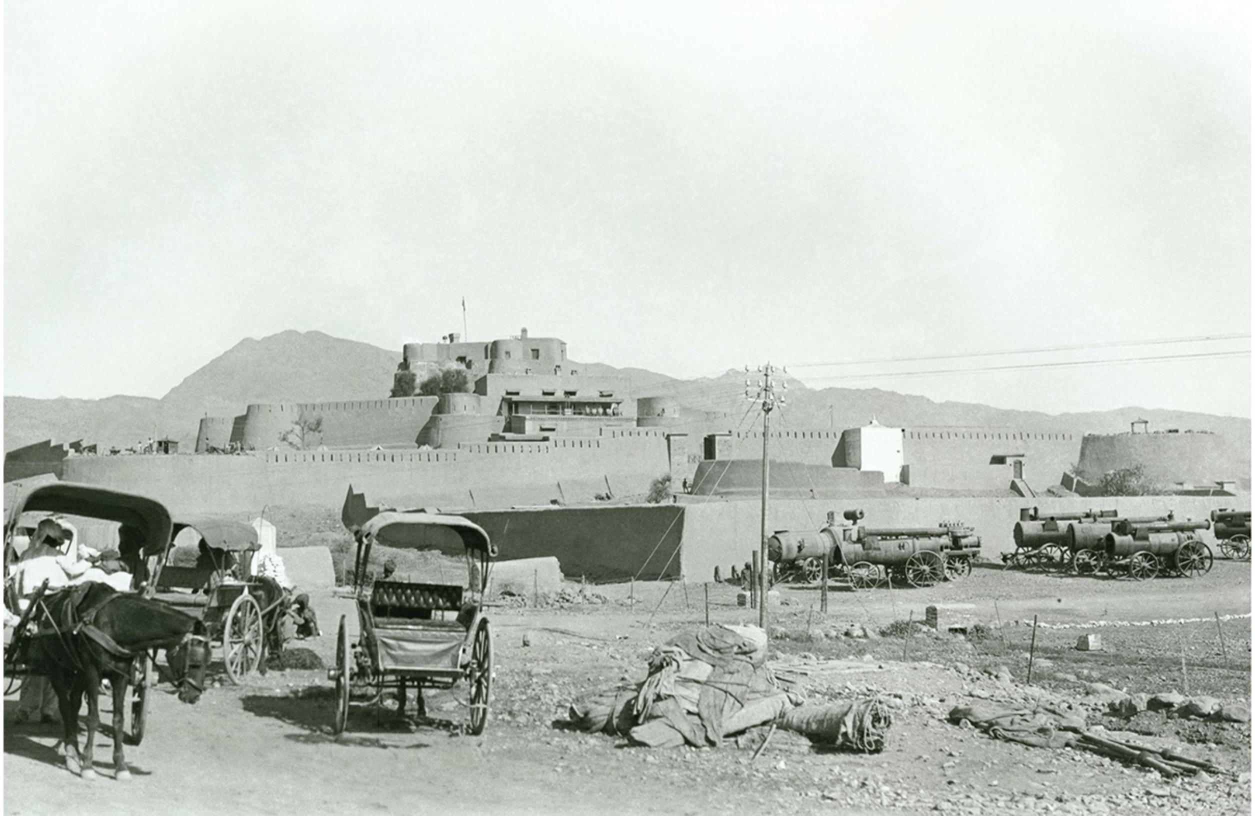
The likely future nature of fortification will probably be affected by the increased opportunities for attackers created by missiles and drones. These opportunities will be enhanced by the aerial reconnaissance readily gained from drones and satellites. Indeed, because of these threats, forts will take on some of the characteristics of units in the field. They will have to offer an active defence that aims to destroy attacking platforms, weapons and projectiles at a distance. In this respect, individual units will bring together the fixed fortification and field units of the past.

At the same time, fortification, albeit of a very different type, is also pursued by the opponents of authority, notably in trying to mobilise civilian support and to turn neighbourhoods into 'no-go zones', a process symbolised, in the nineteenth century, by the creation of barricades. This was a particular facet of urban rebellion and resistance, as in Belfast and Londonderry in the early stages of the IRA activities in Northern Ireland before the British army overcame these positions in Operation Motorman in 1972.

There were also rural counterparts, with the fortification of individual buildings and villages, and of natural features such as caves. In 1937, JFC Fuller, a retired British major general, visited Spain during its civil war, reporting to British Military Intelligence: 'The front is totally unlike the fronts in the World War… in no way continuous… The villages normally are natural fortresses, generally walled all round, and whichever side holds them "holds" the intervening gaps as well.' In 1999, when the Russians threatened the breakaway republic of Chechnya in the Caucasus, President Maskhadov of Chechnya called on all men to mobilise themselves and declared: 'Every village must be turned into a fortress.' In 2002, the Al-Qaeda resistance in Afghanistan made a skilful defence of the caves of the Tora Bora complex in eastern Afghanistan.

These examples underline the degree to which fortification remains a key means and method, goal and issue in military matters and, indeed, in the use of power and force by a variety of agencies, both of the state and of its opponents. There is no sign that this situation will change and technologically focused discussion of the future of war needs to devote more attention to the subject. The technological focus, as in discussion in the 1990s of a supposed Revolution in Military Affairs and in the 2000s of Transformation, is very different in its concerns due to the general emphasis on the attack and, in particular, on its effectiveness. Thus, the tank and the aircraft dominate attention, and discussion of the future highlights how they will be replaced, and not analyses and narratives of warfare that centre on fortifications.

War-torn regions scarcely suggest that this neglect is appropriate. The physical appearance of fortifications and fortresses may continue to change, as they have done across time, but the underlying reality of their significance remains. Aside from changing contexts, technological, military and political, goals have to be assessed when discussing the value of fortifications. Were they primarily designed to deter attack, delay advances or make them costly, and which criterion proved most appropriate? These points are valid if fortification is extended to include defences against cyber-attacks. The character and context of fortification changes, but it remains crucial to conflict.



JAMRUD FORT, AFGHANISTAN, *c*.1915–19 A photograph from 1915–19 of Jamrud Fort on the eastern end of the Khyber Pass. The fort was built in 1836–37 by the Sikh general Hari Singh Nalwa, a fort builder, after conquering the area from local tribesmen. Built with thick walls, the poorly protected fort was captured by the Afghans later in 1837. Jamrud later served as a British base, notably for operations in Afghanistan in 1878–79 and in the Tirah Campaign of 1897–98. It was the collecting station for the Khyber tolls and a base of the Khyber Rifles, an auxiliary unit for the army raised among local tribesmen.

GALLIPOLI, TURKEY, 1915

Mapping from aerial photographs to show details of advanced Turkish trenches based on information available up to the afternoon of 1 June 1915. Mounted on 25 April 1915, the landings were mishandled, in part because of a failure to push initial advantages, with the result that commanding high ground was left to the Turks, who contained the attacking forces. In June, Lieutenant-General Sir William Birdwood reported: ‘It seems quite ridiculous that we should be within ten yards of each other, and yet I am unable to get into their trenches.’ In May, he had referred to ‘a state of siege’. John Monash, an Australian brigade commander, observed: ‘We have got our battle procedure now thoroughly well organised. To a stranger it would probably look like a disturbed ant-heap with everybody running a different way, but the thing is really a triumph of organisation… although the air is thick with clamour and bullets and bursting shells, and bombs and flares.’

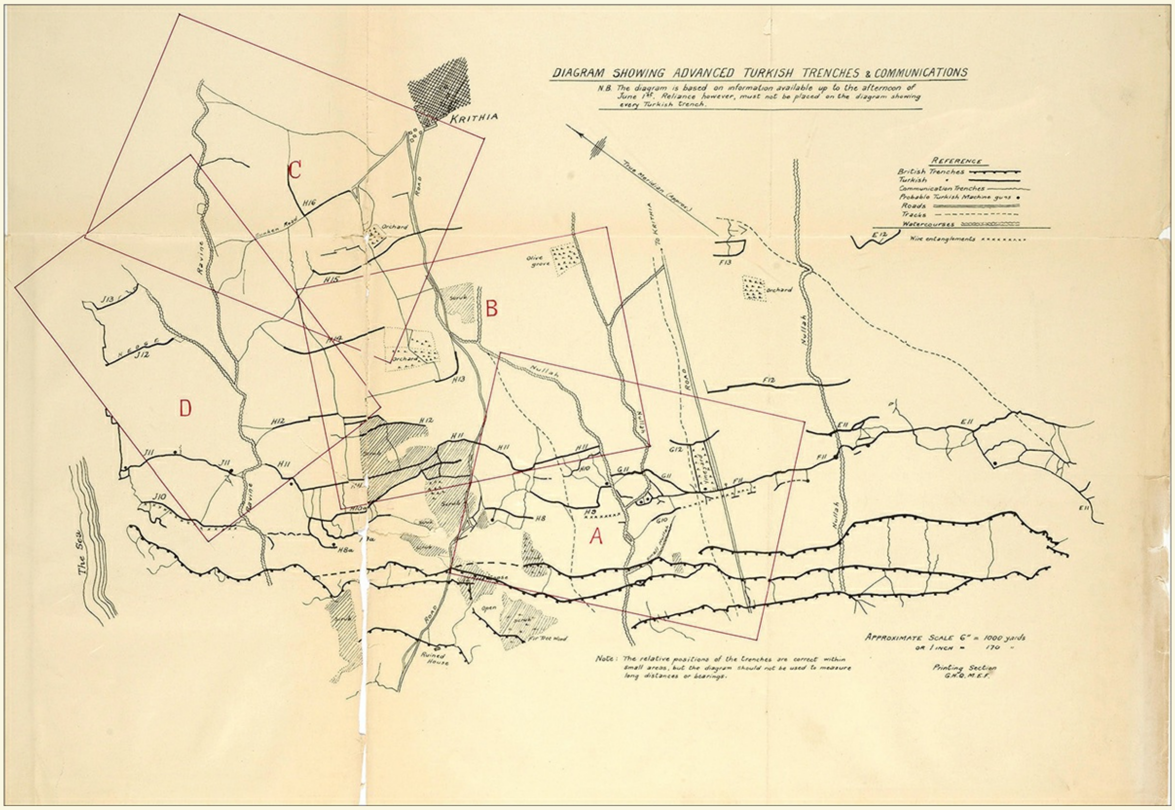
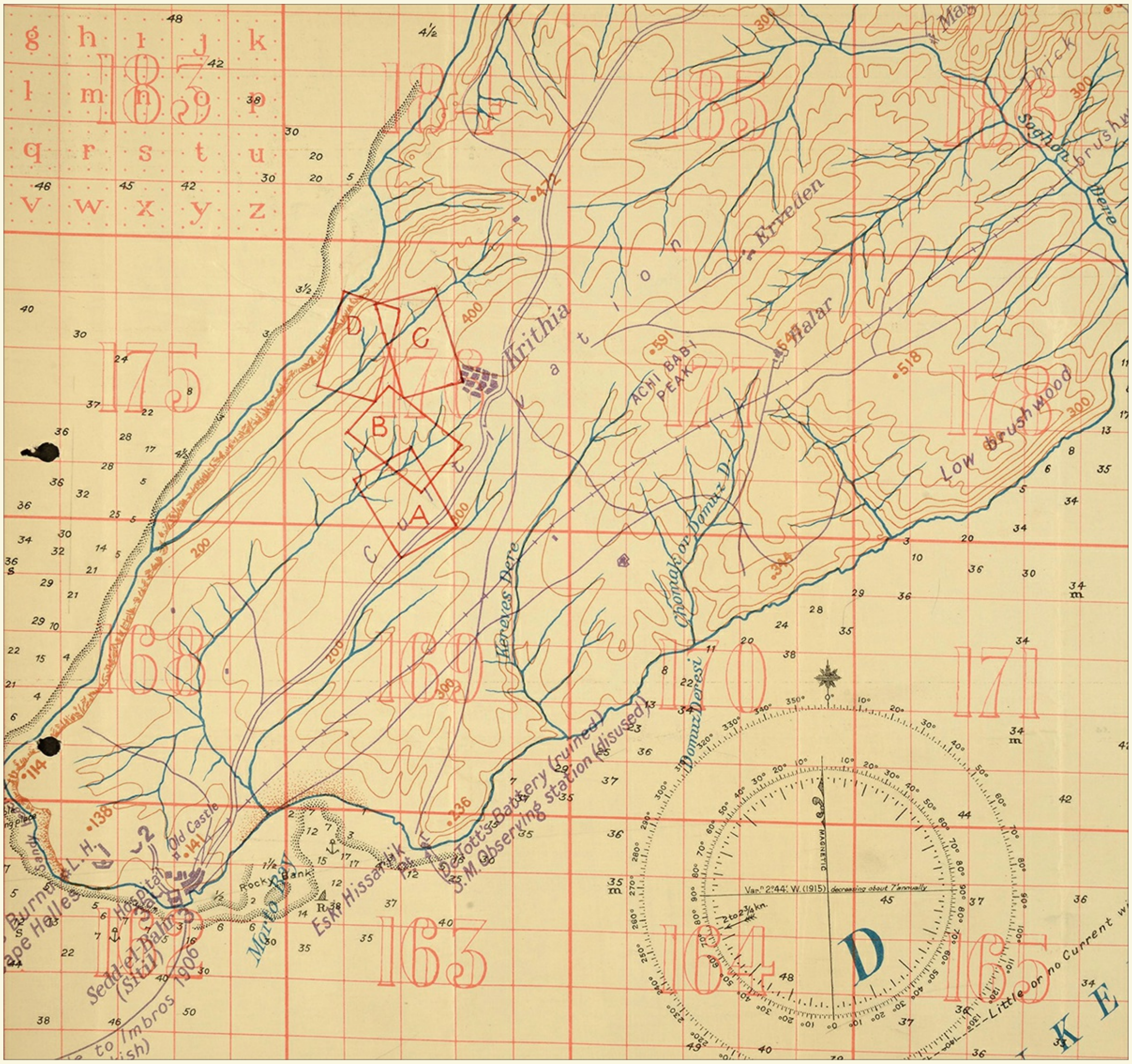
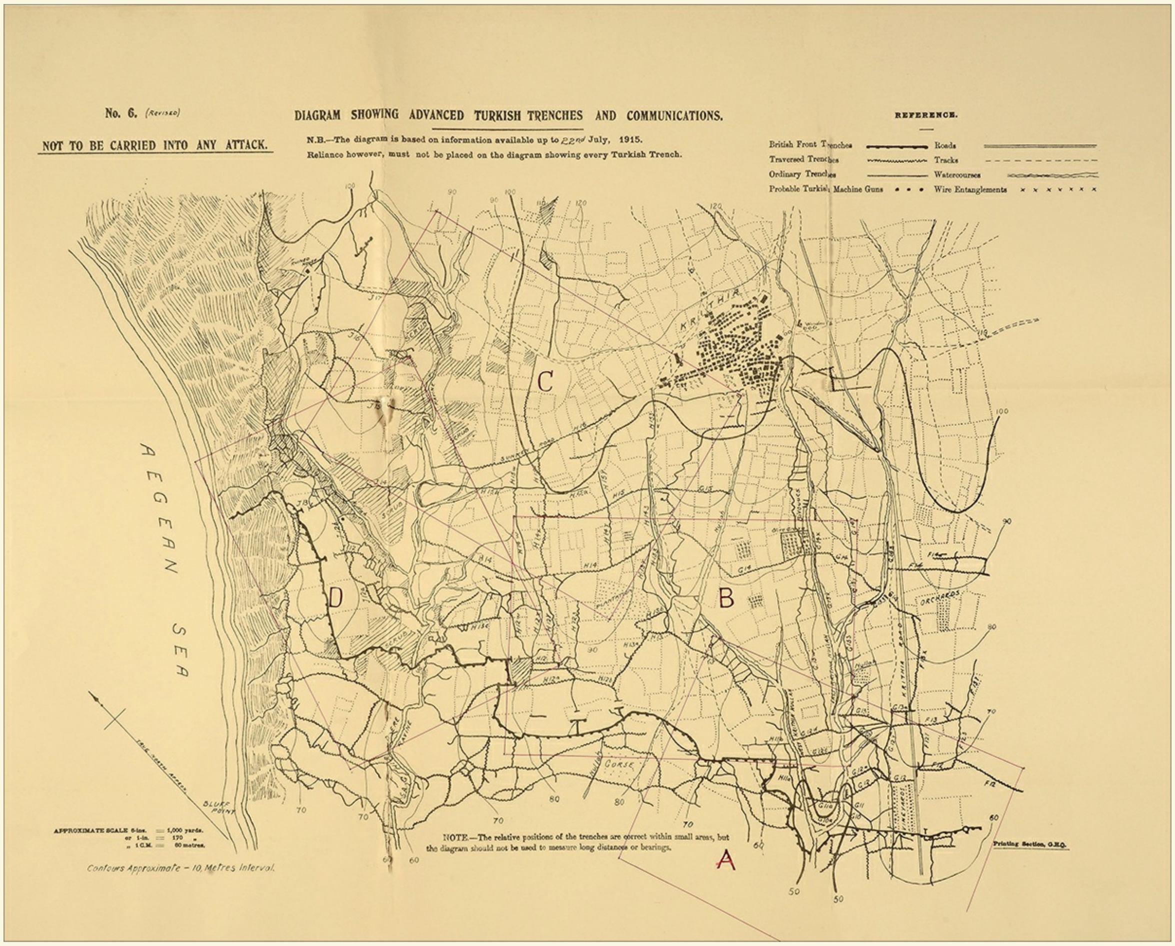


DIAGRAM SHOWING ADVANCED TURKISH TRENCHES & COMMUNICATIONS
N.B. The diagram is based on information available up to the afternoon of June 1st. Reliance however, must not be placed on the diagram showing every Turkish trench.
REFERENCE
British Trenches
Turkish
Communication Trenches
Probable Turkish Machine guns
Roads
Tracks
Watercourses
Wire entanglements
True Meridian (Approx.)
KRITHIA
TO KRITHIA
Orchard
Olive grove
Nullah
Ravine
Road
The Sea
Ruined House
A
B
C
D
E12
F13
F12
F11
E11
G12
G11
G10
H16
H15
H14
H13
H12
H11
H10
H9
H8
J13
J12
J11
J10
APPROXIMATE SCALE 6" = 1000 yards
OR 1 INCH = 170 "
Note: The relative positions of the trenches are correct within small areas, but the diagram should not be used to measure long distances or bearings.
Printing Section
G.H.Q. M.E.F.

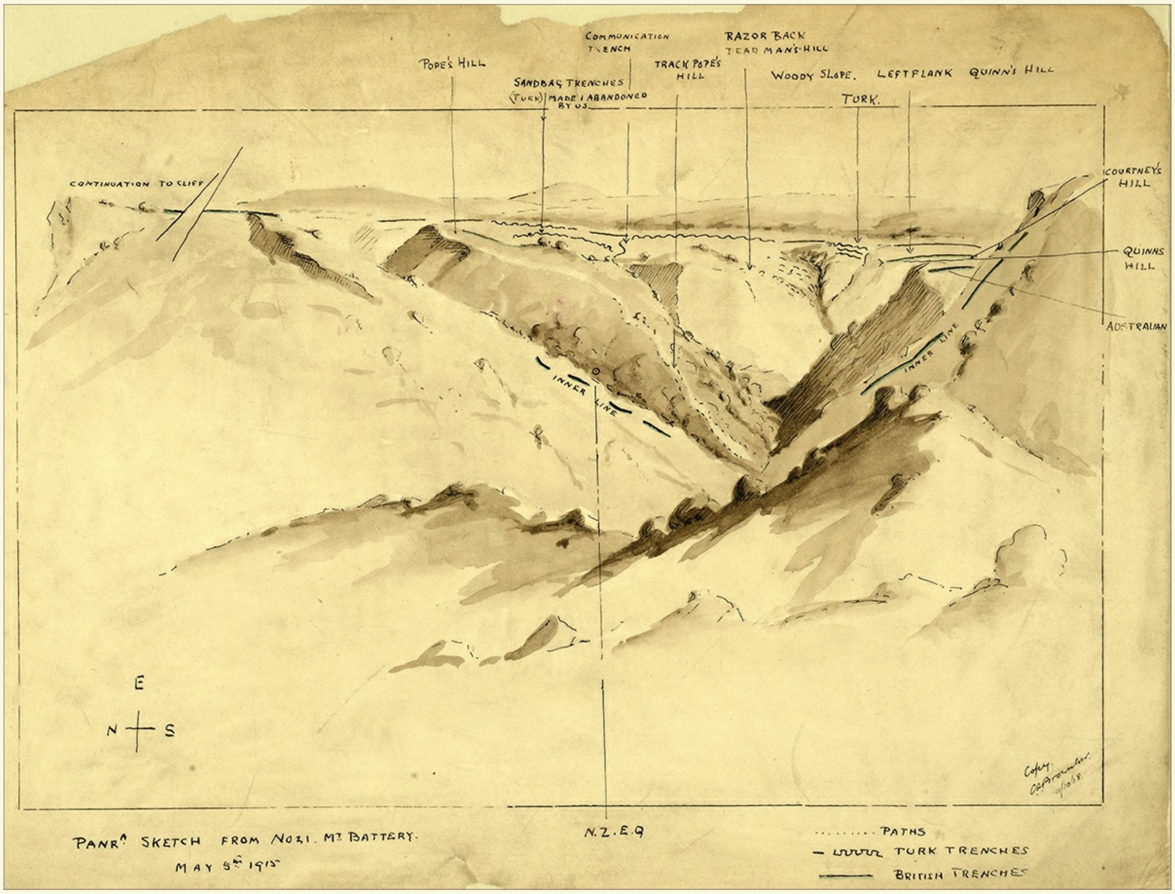
PLAN OF ADVANCED TURKISH TRENCHES AND COMMUNICATIONS UP TO 1 JUNE 1915. THE WIRE ENTANGLEMENTS ARE INDICATED WITH LETTERS AND NUMBERS AT VARIOUS POINTS ON THE TURKISH TRENCHES.


Krithia
ACHI BABI PEAK
Kereves Dere
Chomak or Domuz D.
Domuz Deresi
Kaval Dere
Kirveden
Halar
Low Brushwood
Old Castle
Hospital
Sedd-el-Bahr (Site)
Morto Bay
Rocky Bank
Eski Hissarlik
De Tott's Battery (ruined)
S.M. Observing Station (disused)
to Imbros 1906
Little or no Current
A
B
C
D
175
176
177
178
168
169
170
171
163
164
165
183
184
185
186

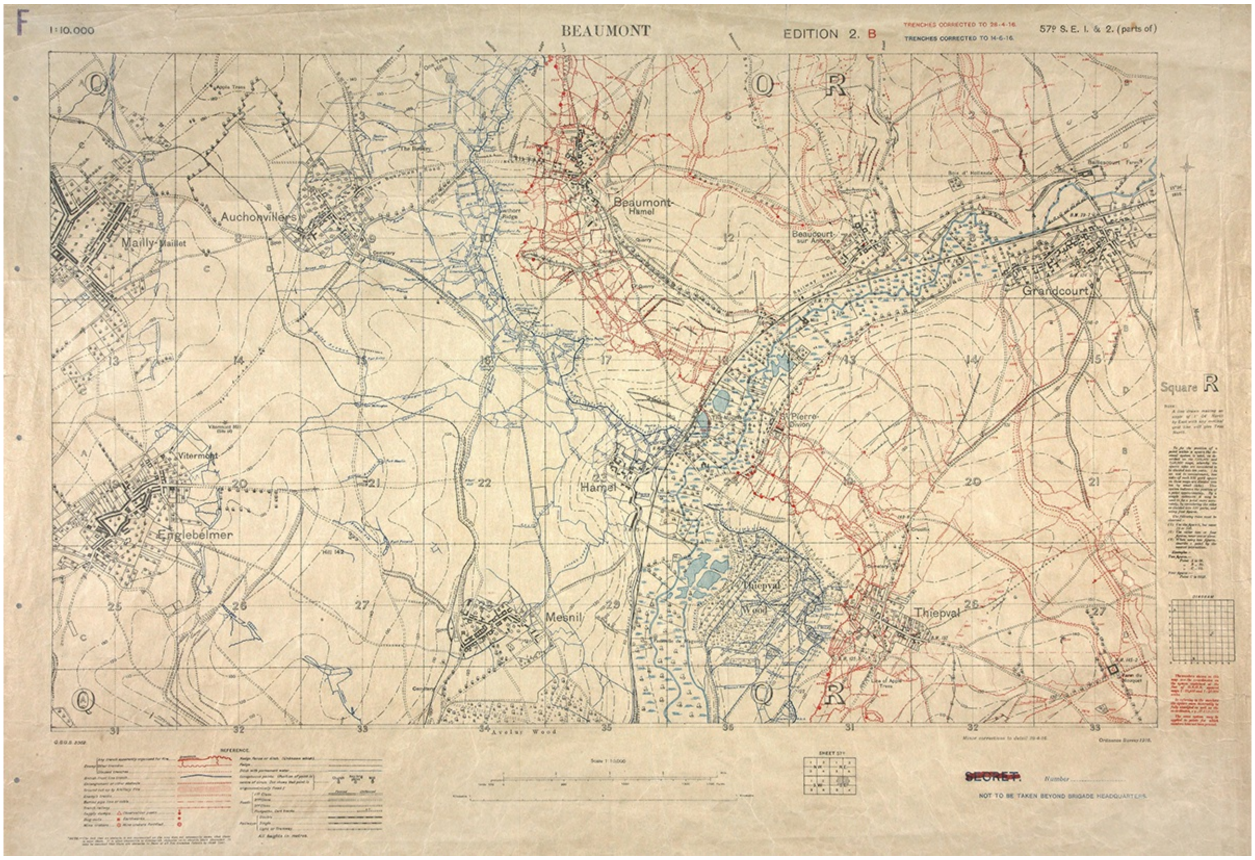
AERIAL PHOTOGRAPHS WERE USED TO COMPILE THIS MAP OF GALLIPOLI WHICH INDICATES PRIMARILY THE LIE OF LAND AND THE POSITION OF A NUMBER OF BATTERIES, BOTH IN USE AND ABANDONED.


No. 6. (Revised)
NOT TO BE CARRIED INTO ANY ATTACK.
DIAGRAM SHOWING ADVANCED TURKISH TRENCHES AND COMMUNICATIONS.
N.B.—The diagram is based on information available up to 22nd July, 1915.
Reliance however, must not be placed on the diagram showing every Turkish Trench.
REFERENCE.
British Front Trenches
Traversed Trenches
Ordinary Trenches
Probable Turkish Machine Guns
Roads
Tracks
Watercourses
Wire Entanglements
KRITHIA
AEGEAN SEA
A
B
C
D
GORSE
VINEYARDS
ORCHARDS
BLUFF POINT
TRUE NORTH APPROX.
APPROXIMATE SCALE 6-ins. = 1,000 yards.
or 1-in. = 170 "
" 1 C.M. = 60 metres.
Contours Approximate – 10 Metres Interval.
NOTE.—The relative positions of the trenches are correct within small areas, but the diagram should not be used to measure long distances or bearings.
Printing Section, G.H.Q.

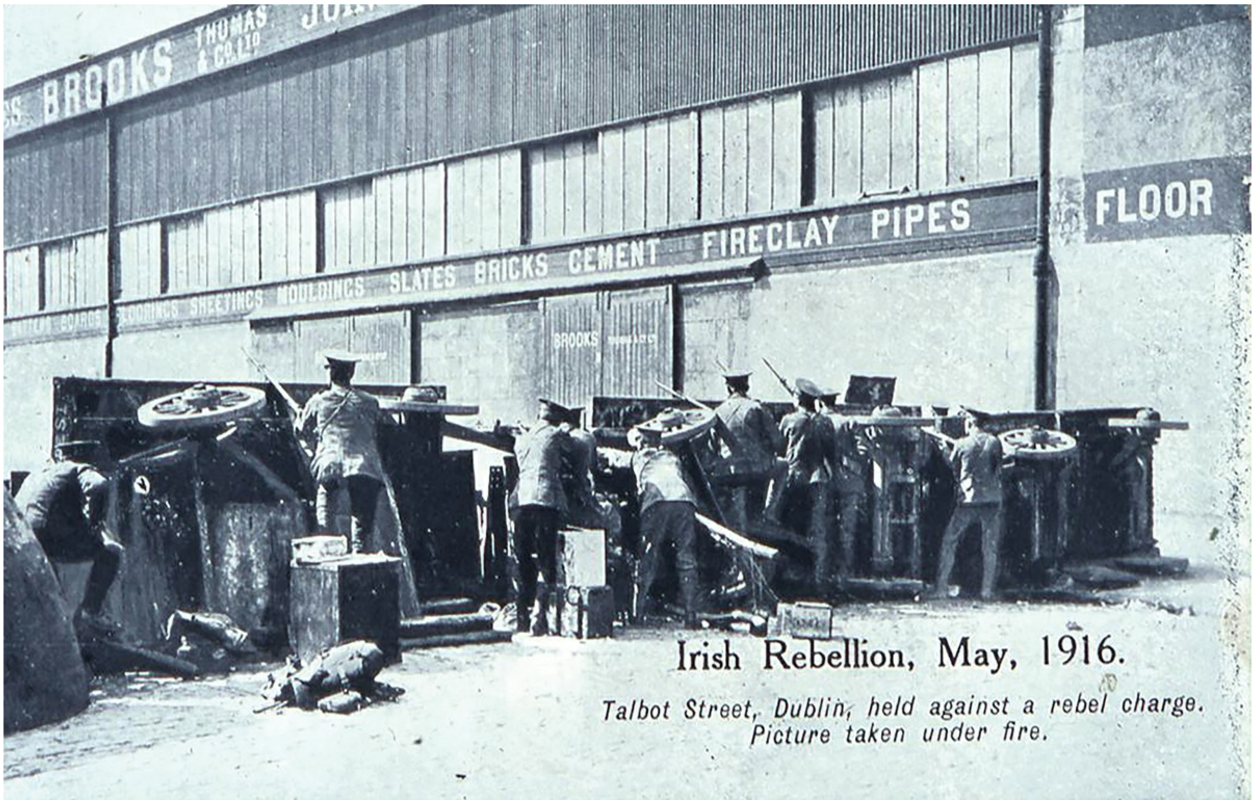
PLAN OF ADVANCED TURKISH TRENCHES TO 22 JULY, 1915.


COMMUNICATION TRENCH
RAZOR BACK
DEAD MAN'S HILL
POPE'S HILL
SANDBAG TRENCHES (TURK) MADE & ABANDONED BY US.
TRACK POPE'S HILL
WOODY SLOPE.
LEFT FLANK
QUINN'S HILL
TURK.
CONTINUATION TO CLIFF
COURTNEY'S HILL
QUINNS HILL
AUSTRALIAN
INNER LINE
INNER LINE
E
N
S
Copy. C.A.Brownlow. 11/10/18.
PANR^A SKETCH FROM NO 21. M^T BATTERY.
MAY 5^TH 1915
N.Z.E.Q
PATHS
TURK TRENCHES
BRITISH TRENCHES

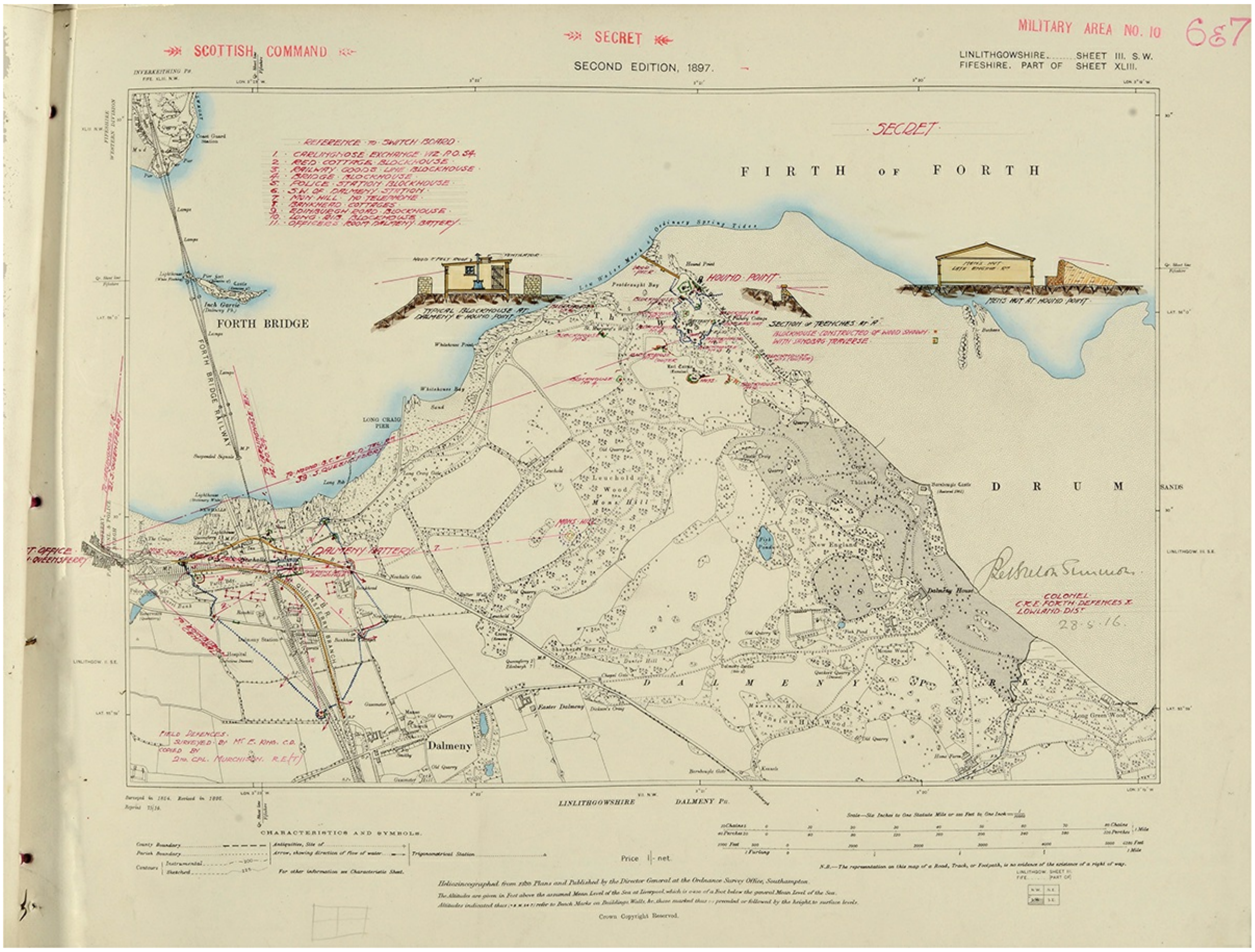
PANORAMA SKETCH FROM THE POSITION OF NO 21 MT BATTERY, GALLIPOLI, 1915.


F
1:10.000
BEAUMONT
EDITION 2. B
TRENCHES CORRECTED TO 26-4-16
TRENCHES CORRECTED TO 14-6-16
57D S.E. 1 & 2. (parts of)
Auchonvillers
Mailly-Maillet
Beaumont-Hamel
Beaucourt-sur-Ancre
Grandcourt
St Pierre-Divion
Hamel
Thiepval Wood
Thiepval
Mesnil
Englebelmer
Aveluy Wood
Square R
SECRET.
NOT TO BE TAKEN BEYOND BRIGADE HEADQUARTERS

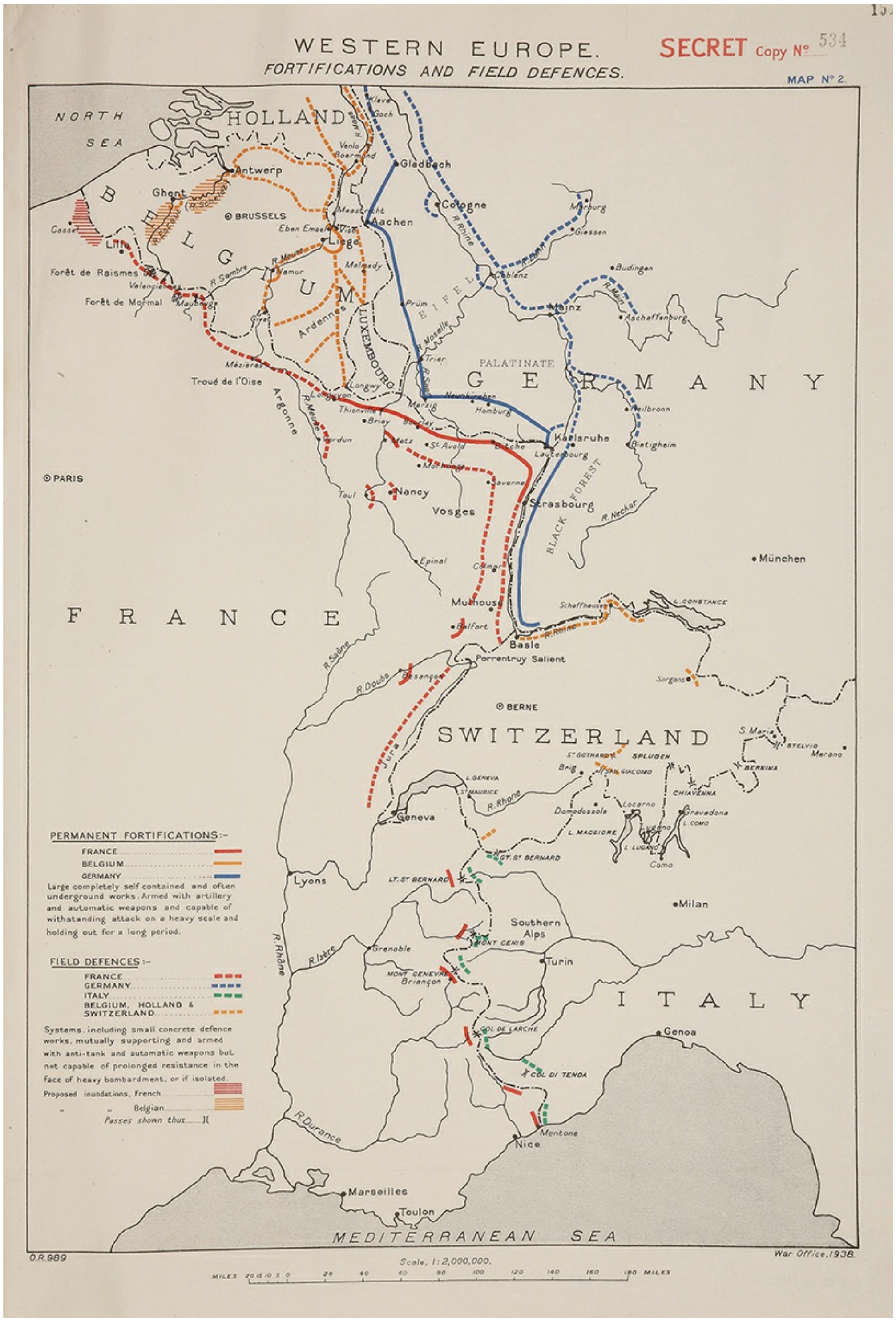
BEAUMONT-HAMEL, FRANCE, TRENCHES TO 14 JUNE 1916 Beaumont-Hamel was situated near the northern end of the German front unsuccessfully attacked in the Somme offensive on 1 July 1916. The Germans had dug impressive defences including deep dugouts, which provided protection from artillery fire and from which troops could readily move to the firing line in the front line trench. The Newfoundland Regiment took particularly heavy casualties there on 1 July


BROOKS THOMAS & CO. LTD
FIRECLAY PIPES
FLOOR
SLATES BRICKS CEMENT
MOULDINGS
SHEETINGS
BROOKS
Irish Rebellion, May, 1916.
Talbot Street, Dublin, held against a rebel charge.
Picture taken under fire.

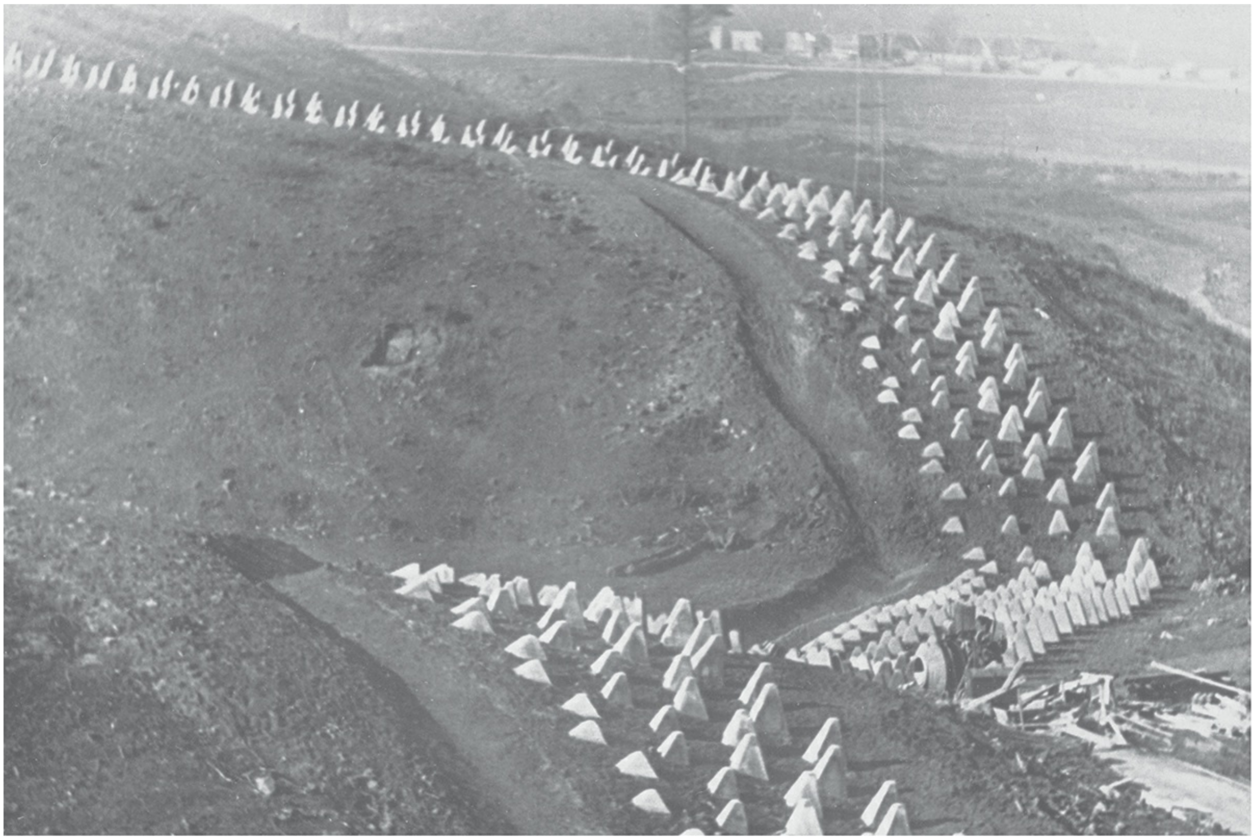
EASTER RISING, IRELAND, 1916 This photograph shows a British defensive position on Talbot Street in Dublin. Such temporary works proved important to the urban fighting that became more common during the twentieth century. About 1,200 men rose in Dublin on Easter Monday, 24 April 1916, seized a number of sites and proclaimed an independent Irish Republic. The rebels suffered from a widespread lack of support as well as bad planning, poor tactics and the strength of the British response. The rebellion ended on 29 April.


SCOTTISH COMMAND
SECRET
SECOND EDITION, 1897.
MILITARY AREA No. 10
6&7
LINLITHGOWSHIRE. SHEET III. S.W.
FIFESHIRE. PART OF SHEET XLIII.
SECRET
FIRTH OF FORTH
REFERENCE TO SWITCH BOARD
1. CARLINGNOSE EXCHANGE VIZ P.O. 54.
2. RED COTTAGE BLOCKHOUSE
3. RAILWAY GOODS LINE BLOCKHOUSE
4. BRIDGE BLOCKHOUSE
5. POLICE STATION BLOCKHOUSE
6. S.W. OF DALMENY STATION
7. MON HILL NO TELEPHONE
8. BANKHEAD COTTAGES
9. EDINBURGH ROAD BLOCKHOUSE
10. LONG RIB BLOCKHOUSE
11. OFFICERS ROOM DALMENY BATTERY
TYPICAL BLOCKHOUSE AT DALMENY & HOUND POINT
HOUND POINT
SECTION OF TRENCHES AT "A"
BLOCKHOUSE CONSTRUCTED OF WOOD SHEWN WITH SANDBAG TRAVERSE
FORTH BRIDGE
FORTH BRIDGE RAILWAY
LONG CRAIG PIER
DALMENY BATTERY
DRUM SANDS
DALMENY PARK
Dalmeny
Dalmeny House
COLONEL C.R.E. FORTH DEFENCES & LOWLAND DIST
28.5.16.
FIELD DEFENCES. SURVEYED BY MR E. KING. C.E. COPIED BY 2ND CPL. MURCHISON. R.E.(T)
LINLITHGOWSHIRE
DALMENY Ps.
CHARACTERISTICS AND SYMBOLS.
Price 1/- net.
Crown Copyright Reserved.

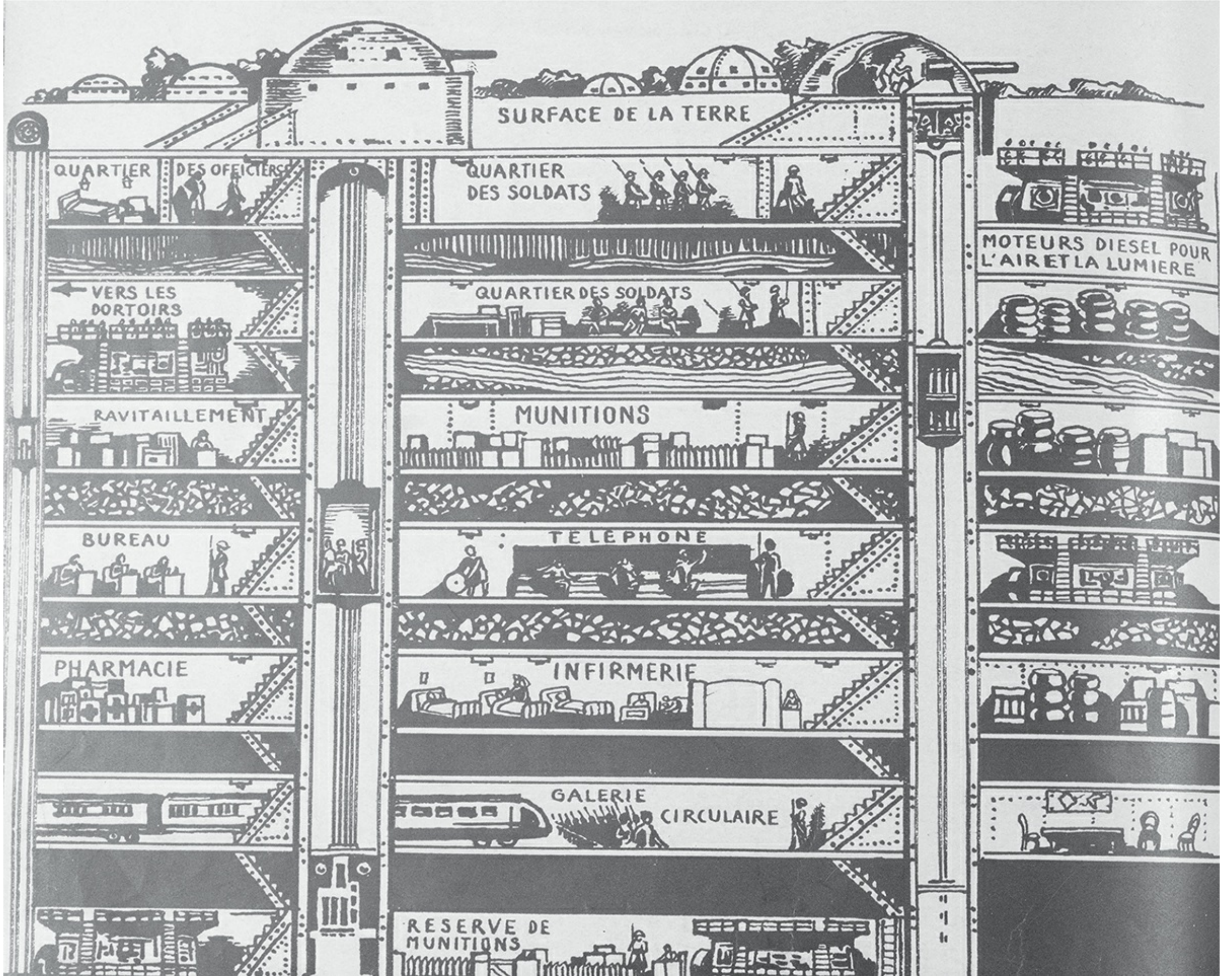
LANDWARD DEFENCES OF BRITISH BATTERIES, SCOTLAND, 1916 Concern about German raiding capability encouraged interest in coastal defences. The naval base at Rosyth in the Firth of Forth made the area particularly sensitive. In practice, the Germans did not intend moving from coastal bombardment to landings. Fire lines were key elements in the location of defences.


WESTERN EUROPE.
FORTIFICATIONS AND FIELD DEFENCES.
SECRET Copy No 534
MAP No 2.
NORTH SEA
HOLLAND
BELGIUM
LUXEMBOURG
GERMANY
FRANCE
SWITZERLAND
ITALY
MEDITERRANEAN SEA
Antwerp
Ghent
BRUSSELS
Liège
Aachen
Cologne
Gladbach
Coblenz
Mainz
Karlsruhe
Strasbourg
Metz
Nancy
Vosges
Mulhouse
Basle
Porrentruy Salient
BERNE
Geneva
Lyons
Southern Alps
Turin
Milan
Genoa
Nice
Mentone
Marseilles
Toulon
PARIS
München
PALATINATE
BLACK FOREST
PERMANENT FORTIFICATIONS:-
FRANCE
BELGIUM
GERMANY
Large completely self contained and often underground works. Armed with artillery and automatic weapons and capable of withstanding attack on a heavy scale and holding out for a long period.
FIELD DEFENCES:-
FRANCE
GERMANY
ITALY
BELGIUM, HOLLAND & SWITZERLAND
Systems, including small concrete defence works, mutually supporting and armed with anti-tank and automatic weapons but not capable of prolonged resistance in the face of heavy bombardment, or if isolated.
Proposed inundations, French
Belgian
Passes shown thus)(
O.R.989
Scale, 1:2,000,000.
War Office, 1938.
MILES

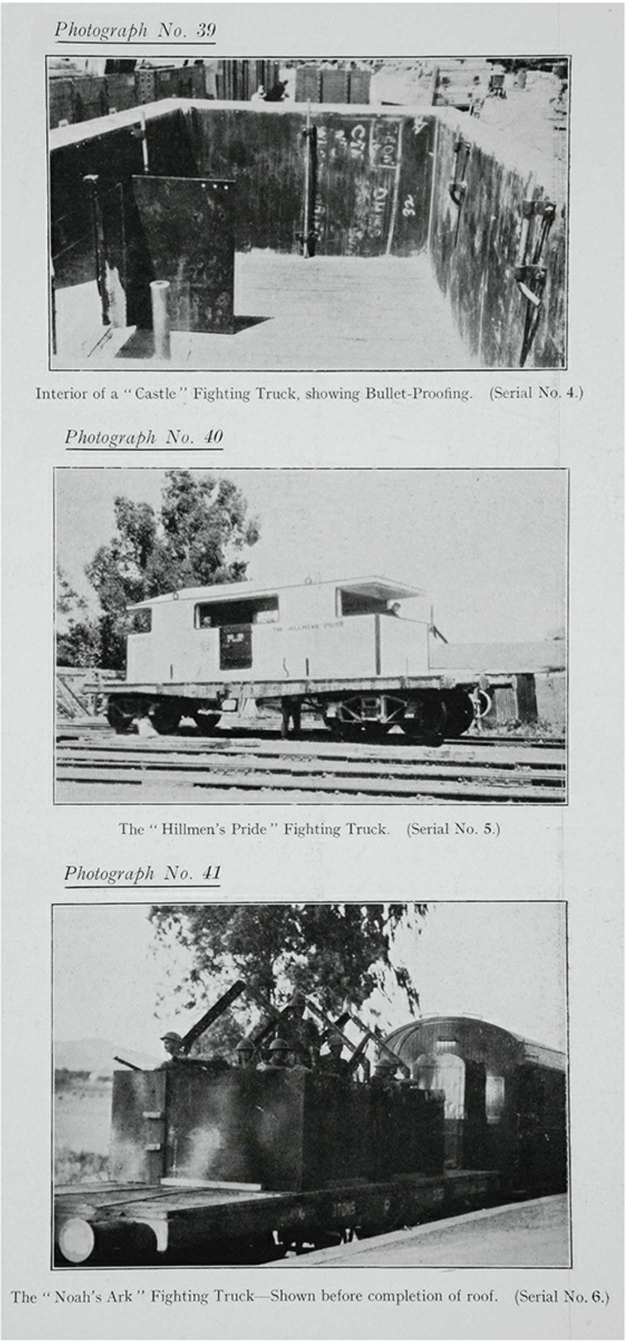
WESTERN EUROPE FORTIFICATIONS AND FIELD DEFENCES, PRODUCED BY THE BRITISH WAR OFFICE, 1938 An assessment of exposure to invasion. The strength of German defences was exaggerated: they did not compare to the French Maginot Line. Moreover, the map underplayed the role of the terrain, in the shape of mountains, passes and rivers. The map did not include coastal and port defences, for example in Provence. In 1940, field defences were to be found seriously wanting.



SIEGFRIED LINE Opposing the Maginot Line, the Germans planned the 391-mile long Westwall from 1936 but construction only started in 1938. This was not designed to be as strong as the Maginot Line, but instead to delay attackers so that reserves could be moved up, a facet of defensive systems that it can be too easy to overlook. The focus was on mutually supporting pillboxes and concrete anti-tank defences, as shown here. Upgraded in 1944, the defences held off American attack in part because the terrain and weather helped the defenders that autumn. Once the Allies had consolidated their forces and resumed their offensive in 1945, the defences of the Siegfried Line proved vulnerable, in particular to concentrated and mobile firepower. Tank-infantry teams, supported by artillery fire and demolitions, had a devastating impact on individual positions.


SURFACE DE LA TERRE
QUARTIER DES OFFICIERS
QUARTIER DES SOLDATS
MOTEURS DIESEL POUR L'AIR ET LA LUMIERE
← VERS LES DORTOIRS
QUARTIER DES SOLDATS
RAVITAILLEMENT
MUNITIONS
BUREAU
TELEPHONE
PHARMACIE
INFIRMERIE
GALERIE CIRCULAIRE
RESERVE DE MUNITIONS

MAGINOT LINE, FRANCE, 1940 The failure of the Maginot Line continues to be a much-cited instance of the limitations of defensive fortification and defensive strategies as a whole, as well as more particularly, of the French in 1940. This failure is often held up as the product of the drawbacks of resting on the defensive. In practice, the Line guided the direction of the German attack to the north, and the French failed both because they committed their mobile reserve to advancing towards the Netherlands and because the Germans were able to break through the French positions on the Middle Meuse which were not part of the Line.



Photograph No. 39

Interior of a "Castle" Fighting Truck, showing Bullet-Proofing. (Serial No. 4.)

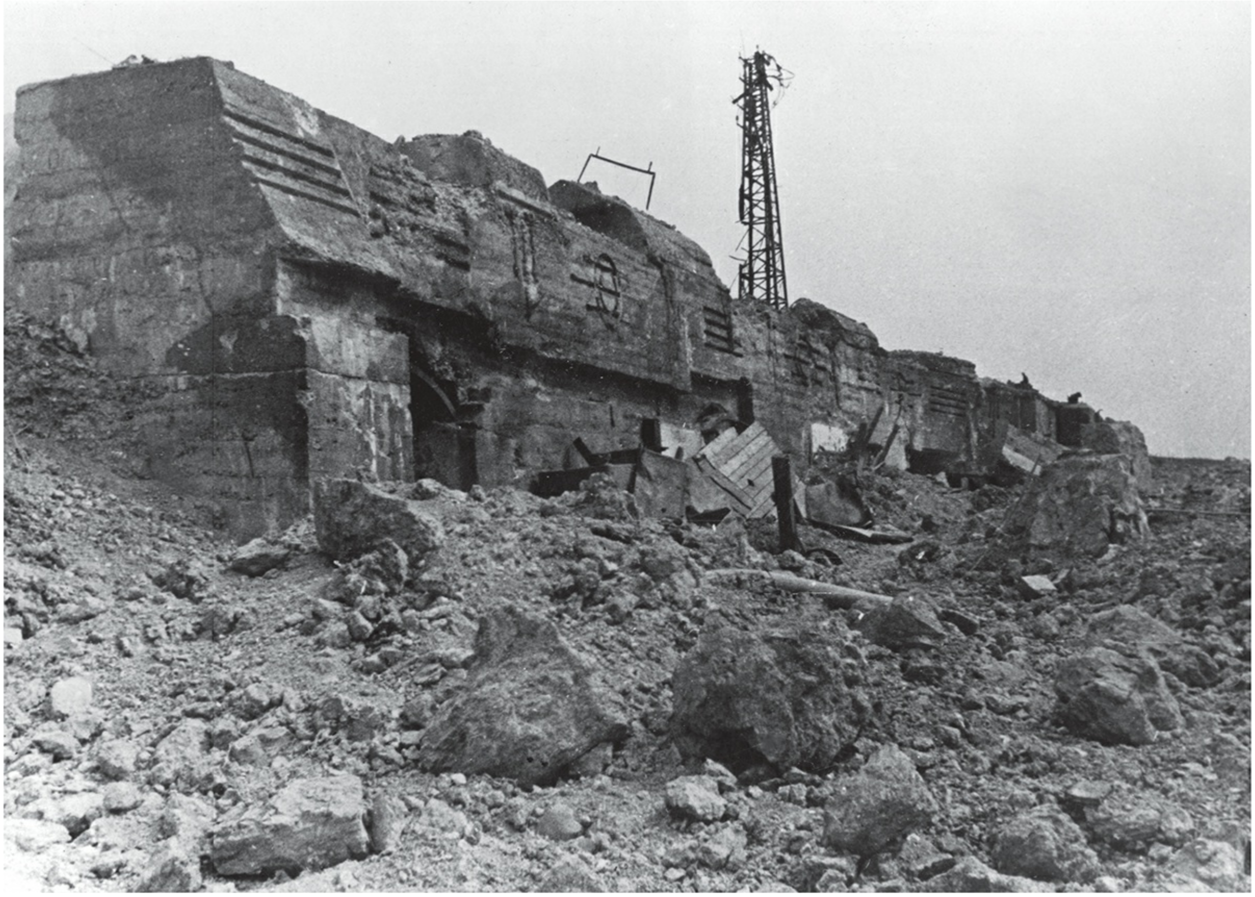
Photograph No. 40

The "Hillmen's Pride" Fighting Truck. (Serial No. 5.)

Photograph No. 41

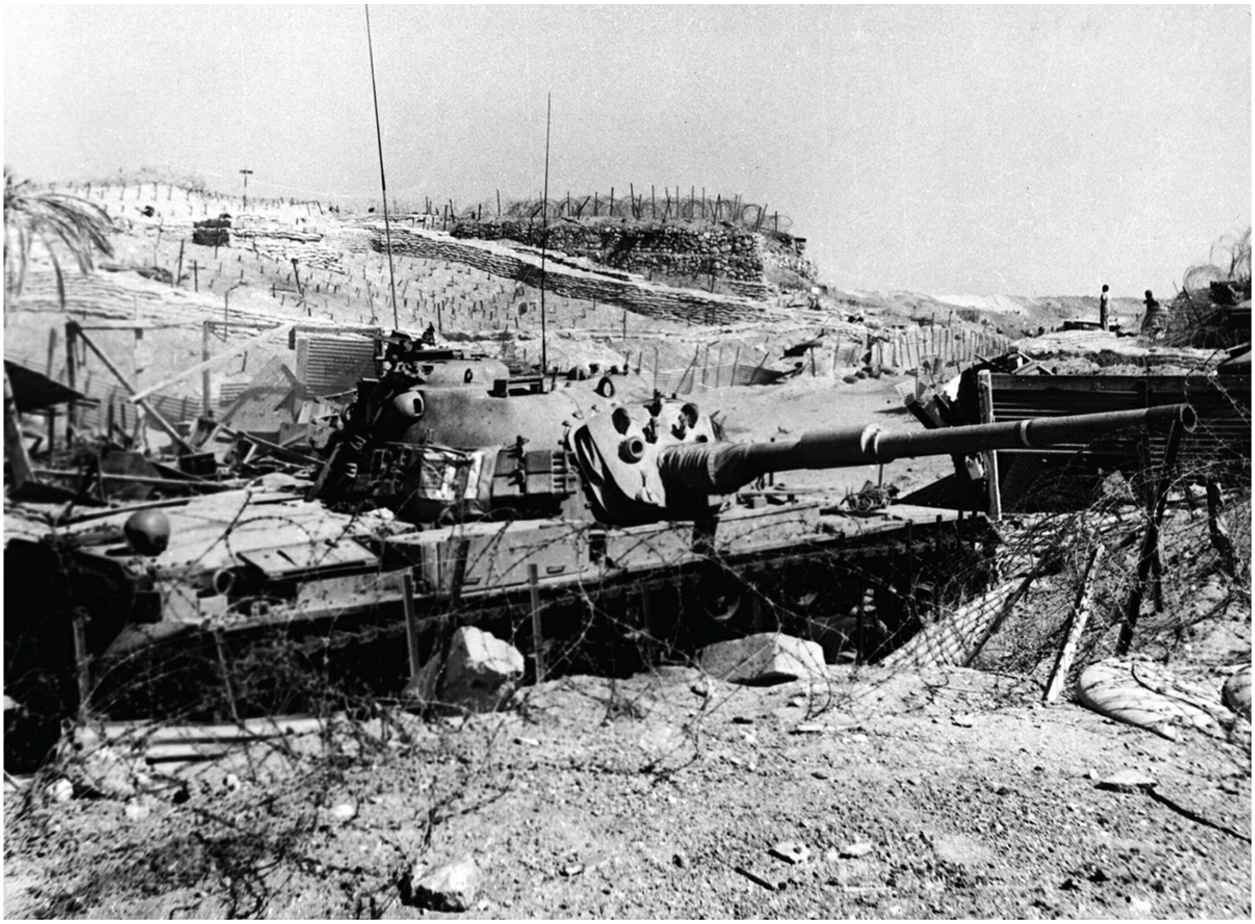
The "Noah's Ark" Fighting Truck—Shown before completion of roof. (Serial No. 6.)

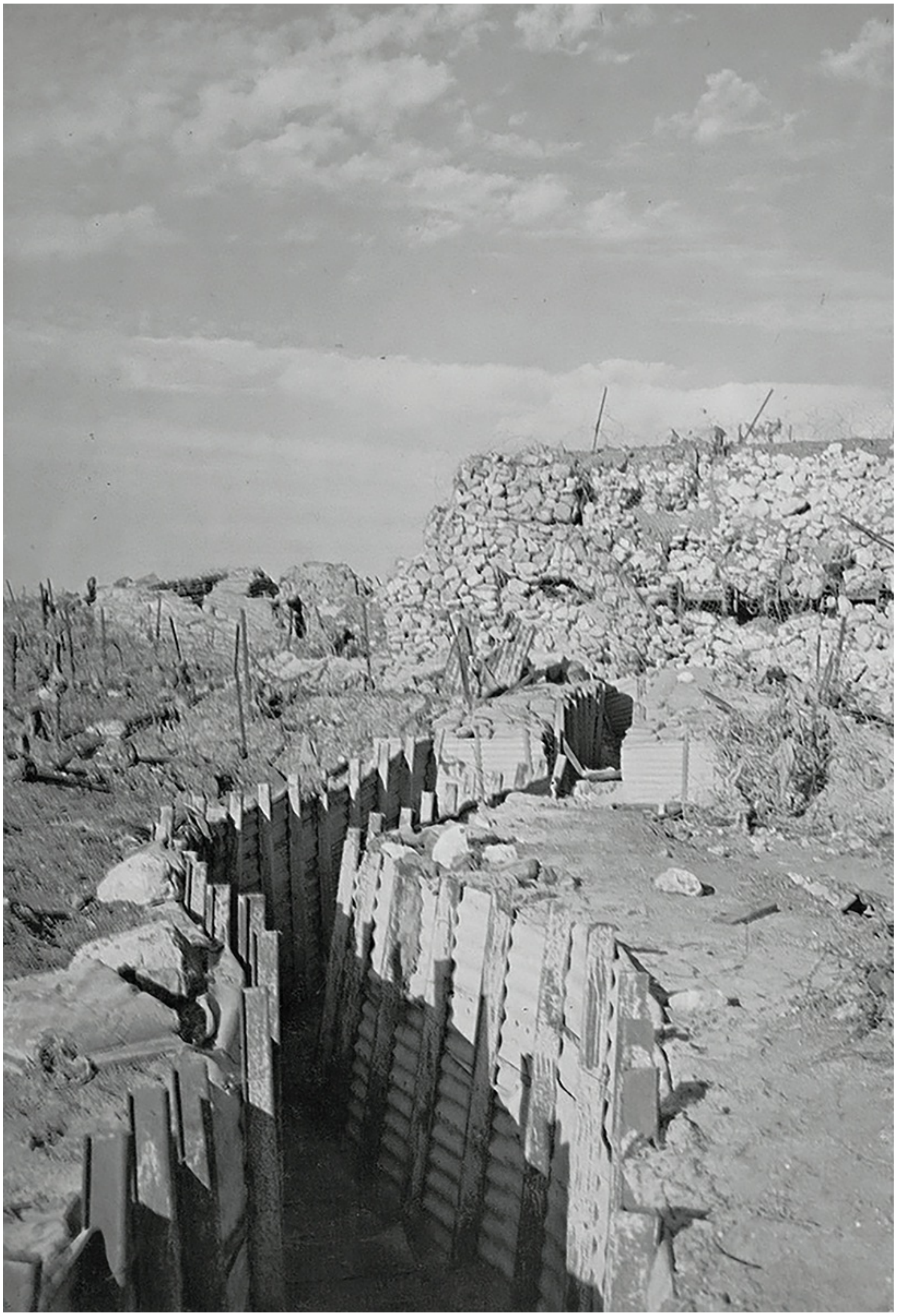
FORTIFIED TRAINS DURING THE ARAB RISING, PALESTINE, 1937–39 Initially, the Arab Rising posed a serious problem for the British, and they were unable to maintain control of much of the countryside. Road and rail links had to be protected against attack. Eventually, a large British reinforcement suppressed the rising, combined with active patrolling and collective punishments to weaken support for the guerrillas.



RUINS OF FORT AT SEVASTOPOL, RUSSIA, 1942 At Sevastopol, the Soviet defences included bunkers, machine gun nests, minefields and barbed-wire obstacle belts. The Germans used, alongside conventional units, tracked mines to destroy fortifications, three 600mm self-propelled mortars and one 800mm gun (which had little success), as well as rocket launchers. The Germans supported their artillery with repeated and heavy air attacks. Although unsuccessful, the Soviet defence diverted German forces.

PRESIDIO OF SAN FRANCISCO, UNITED STATES An excellent defensive position commanding the entrance to the major anchorage of San Francisco Bay, the Presidio was built as a Spanish fort in 1776 in order to establish control in the face of British and Russian interest in the coast. In 1846, the Presidio was seized from Mexico by the Americans and it became a base designed to protect San Francisco from possible British attack and, subsequently, as part of the strategic infrastructure of America's developing Pacific power. As such, the Presidio was important to defence against Japan in 1941–42. It remained a US army base until closed in 1994.





VIEWS OF THE BAR-LEV LINE, ISRAEL/EGYPT After conquering Sinai from Egypt in 1967, Israel constructed the 150km-long Bar-Lev Line to the east of the Suez Canal. This included not only the canal itself but also a high sand wall, its concrete support forts and strongholds, which comprised bunkers, trenches and minefields and, to the rear, prepared firing positions for tanks. It rapidly fell to Egyptian attack in 1973, but in large part because the defences were taken by surprise and hit by a heavy artillery barrage and a sophisticated engineering assault on the Israeli fortifications, including the use of pumps to remove the sand. Israel air cover was thwarted by effective Soviet-supplied Egyptian surface-to-air missiles.

SELECTED FURTHER READING

Jeremy Black, *Fortifications and Siegecraft: Defense and Attack through the Ages* (Rowman & Littlefield Publishers, 2018).

Christopher Duffy, *Fire and Stone: The Science of Fortress Warfare, 1660–1860* (Booksales, 2006).

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